WEIL-McLAIN

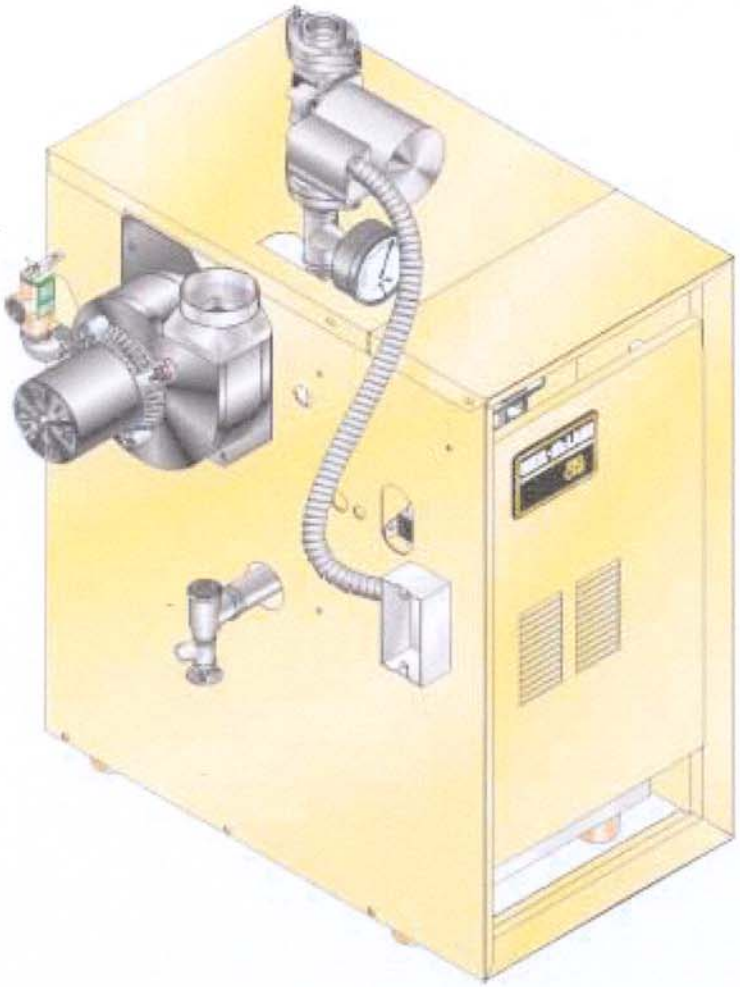
GOLD CGi

GOLD CGi

Series 2 Gas-Fired Water Boiler

Boiler Manual

- Installation
- Start-Up
- Maintenance
- Parts



DESIGN CERTIFIED

WARNING

This manual must only be used by a **qualified heating installer/service technician.** Failure to comply could result in severe personal injury, death or substantial property damage.

Part Number 550-110-710/0200

How it works . . .

① Control module

The control module responds to signals from the room thermostat, air pressure switch and boiler limit circuit to operate the boiler circulator, pilot burner, gas valve and inducer. When room thermostat calls for heat, the control module starts the system circulator and inducer.

The control module runs the inducer long enough to purge the boiler flue passages, then opens the pilot valve and activates pilot ignition spark.

The control module allows up to 15 seconds to establish pilot flame. If flame is not sensed within 15 seconds, the control module will turn off the gas valve, flash the Flame light, and then enter a 15-second postpurge. The control module will then start a new cycle. This will continue indefinitely until pilot flame is established or power is interrupted. Once pilot flame is proven, the control module opens the gas valve to allow main burner flame.

When the room thermostat is satisfied, the control module turns off the gas valve, operates the inducer for a 15-second postpurge and waits for the next heat call.

The control module indicator lights show normal sequence when the lights are on steady. When a problem occurs, the control module flashes combinations of lights to indicate the most likely reason for the problem (see page 47).

② Transformer

The control transformer reduces line voltage to 24 volts for the gas valve and limit circuit.

③ Inducer

The inducer pulls flue gases through the boiler, causing air to be pulled in through the boiler air openings. The inducer pushes the flue gases through the vent pipe as well.

④ Air pressure switch

The air pressure switch signals the control module, telling the control module whether the inducer is working correctly or the vent is blocked.

⑤ Water temperature limit switch

The water temperature limit switch turns off the gas valve if the temperature in the boiler goes above its setting. (The circulator will continue to run as long as there is a call for heat.)

Boiler circulator

The boiler circulator circulates water through the external (system) piping. The circulator is shipped loose, and can be mounted on either the boiler supply or return piping. The factory-installed circulator wiring harness provides ample length for either location. **NOTE** — The control module provides a pump exercising routine. If the boiler is not operated for 30 days, the control module will power the circulator for 30 seconds, then turn off.

Other boiler components:

a supply to system

b return from system

c stainless steel burners

d flue outlet

e gas valve

f pressure/temperature gauge

g relief valve

h air vent connection

i flame rollout thermal fuse element (TFE)

j burner shield

k pilot burner and bracket

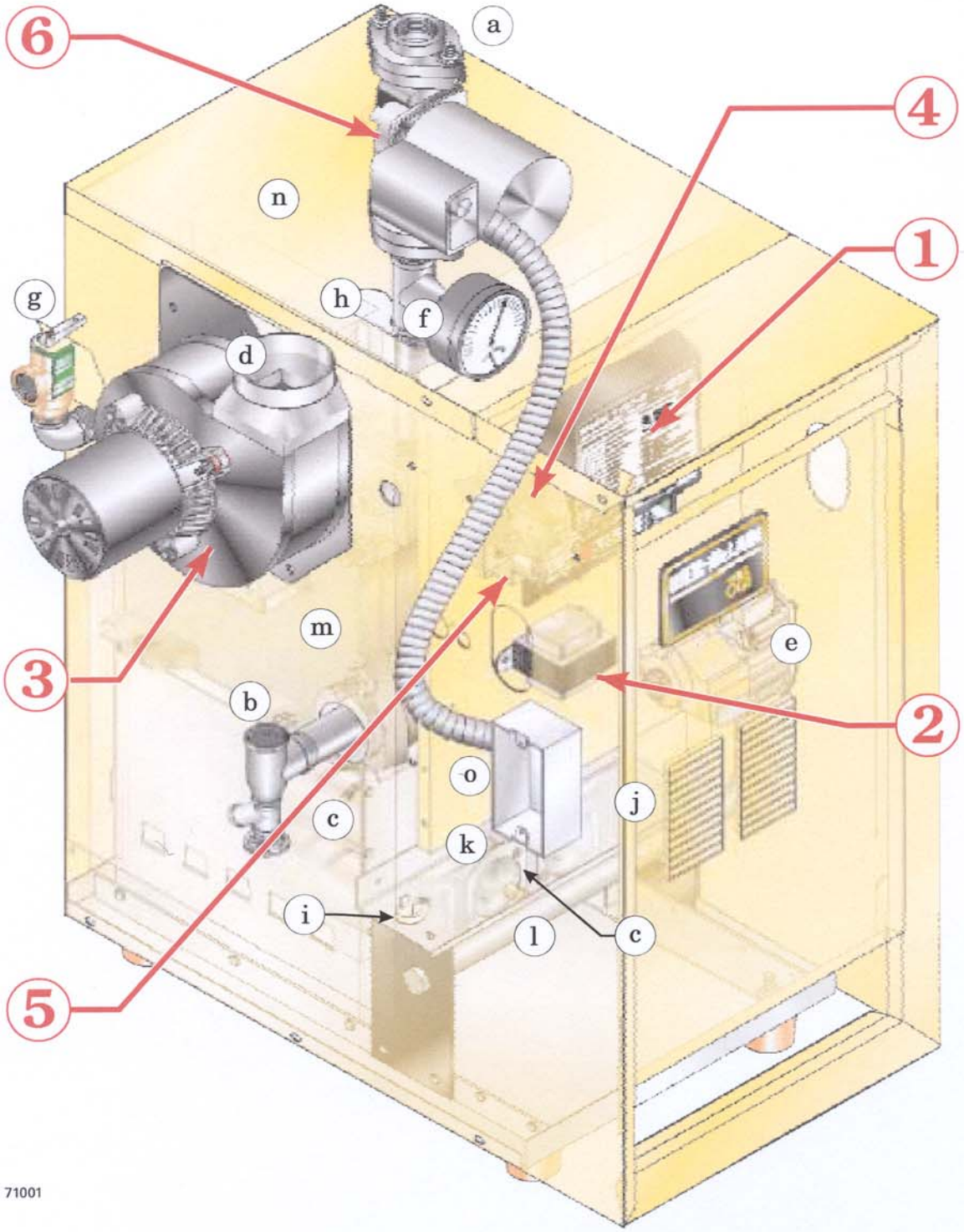
l gas manifold

m cast iron boiler sections

n flue collector

o junction box

GOLD CGi Series 2 Gas-Fired Water Boiler



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Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

DANGER Indicates presence of hazards that **will cause severe** personal injury, death or substantial property damage.

WARNING Indicates presence of hazards that **can cause severe** personal injury, death or substantial property damage.

CAUTION Indicates presence of hazards that **will or can cause minor** personal injury or property damage.

NOTICE Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

Please read before proceeding

Installer

WARNING **Read all instructions before installing.** Follow all instructions in proper order to prevent personal injury or death.

- Consider **piping and installation** when determining boiler location.
- Any **claims for damage or shortage in shipment** must be filed immediately against the transportation company by the consignee.

User

- **This manual is for use only by your qualified heating installer/service technician.**
- Please refer to the **User's Information Manual** for your reference.
- We recommend regular **service by a qualified service technician, at least annually.**

NOTICE When calling or writing about the boiler— Please have the boiler model number from the boiler rating label and the CP number from the boiler jacket. You may list the CP number in the space provided on the **Installation and service certificate** found on page 36.

WARNING Failure to adhere to the guidelines on this page can result in severe personal injury, death or substantial property damage.

When servicing boiler —

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow boiler to cool before performing maintenance.

Boiler operation —

- Do not block flow of combustion or ventilation air to boiler.
- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.
- Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system and any gas control that has been under water.

Boiler water —

- Do not use petroleum-based cleaning or sealing compounds in boiler system. Water seal deterioration will occur, causing leakage between sections. This can result in substantial property damage.
- Do not use "homemade cures" or "boiler patent medicines". Serious damage to boiler, personnel and/or property may result.
- Continual fresh makeup water will reduce boiler life. Mineral buildup in sections reduces heat transfer, overheats cast iron, and causes section failure. Addition of oxygen and other gases can cause internal corrosion. Leaks in boiler or piping must be repaired at once to prevent makeup water.
- Do not add cold water to hot boiler. Thermal shock can cause sections to crack.

Glycol — potential fire hazard —

All glycol is flammable when exposed to high temperatures. If glycol is allowed to accumulate in or around the boiler or any other potential ignition source, a fire can develop. In order to prevent potential severe personal injury, death or substantial property damage from fire and/or structural damage:

- Never store glycol of any kind near the boiler or any potential ignition source.
- Monitor and inspect the system and boiler regularly for leakage. Repair any leaks immediately to prevent possible accumulation of glycol.
- Never use automotive antifreeze or ethylene glycol in the system. Using these glycols can lead to hazardous leakage of glycol in the boiler system.

1a Prepare boiler location — codes & checklist

Installations must follow these codes:

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1–latest edition.
- Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, when required.
- National Electrical Code.
- For Canada only: B149.1 or B149.2 Installation Code, CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

NOTICE The CGi boiler gas manifold and controls met safe lighting and other performance criteria when boiler underwent tests specified in ANSI Z21.13–latest edition.

Before locating the boiler, check the following:

- Check for nearby connection to:
  - System water piping
  - Venting connections
  - Gas supply piping
  - Electrical power
- Check area around boiler. Remove any combustible materials, gasoline and other flammable liquids.

WARNING Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death or substantial property damage.

- Boiler must be installed so that gas control system components are protected from dripping or spraying water or rain during operation or service.
- If new boiler will replace existing boiler, check for and correct system problems, such as:
  1. System leaks causing oxygen corrosion or section cracks from hard water deposits.
  2. Incorrectly-sized expansion tank.
  3. Lack of antifreeze in boiler water causing system and boiler to freeze and leak.

1b Prepare boiler location — clearances

Provide the following clearances:

1. Hot water pipes — at least ½" from combustible materials.
2. Recommended service clearances — See **Figure 1**.
3. Minimum clearances for tight spaces — See **Figure 2**.

Figure 1 Recommended clearances for service

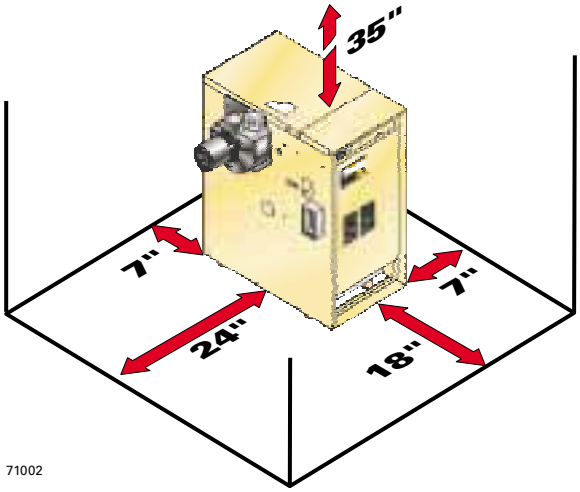
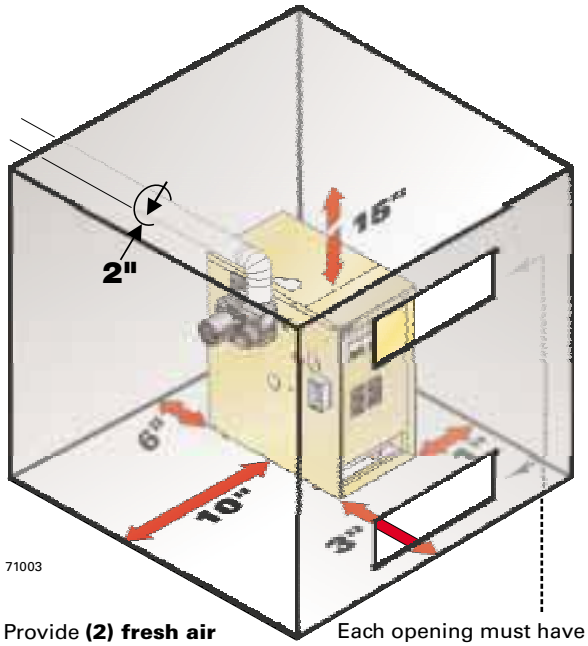


Figure 2 Minimum clearances for tight spaces



Provide **(2) fresh air openings** — 6" from top and 6" from bottom located on wall next to boiler front..

Each opening must have free area of **1** square inch per **1,000 Btuh** of CGi boiler input.

Flooring and foundation

Flooring

The CGi boiler is approved for installation on combustible flooring, but must never be installed on carpeting.

WARNING

Do not install boiler on carpeting even if foundation is used. Fire can result, causing severe personal injury, death or substantial property damage.

Foundation

Provide a solid brick or **minimum 2-inch thick** concrete foundation pad if any of the following is true:

- floor can become flooded.
- the boiler mounting area is not level.

The minimum foundation size is:

Boiler model	Minimum foundation length	Minimum foundation width
CGi-25	25"	12"
CGi-3	25"	12"
CGi-4	25"	15"
CGi-5	25"	18"
CGi-6	25"	21"
CGi-7	25"	24"
CGi-8	25"	27"

Residential garage installation

Precautions

Take the following special precautions when installing the boiler in a residential garage. If the boiler is located in a residential garage, per *ANSI Z223.1, paragraph 5.1.9*:

- Mount the boiler a minimum of **18 inches above the floor** of the garage to assure the burner and ignition devices will be no less than 18 inches above the floor.
- Locate or **protect the boiler** so it cannot be damaged by a moving vehicle.

1c Prepare boiler location — vent system

CGi venting

WARNING Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

DANGER Inspect existing chimney before installing boiler. Failure to clean or replace perforated pipe or tile lining will cause severe personal injury or death.

DANGER Do not install the CGi into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death or substantial property damage.

When removing boiler from existing common vent system:

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

a. **Seal any unused openings** in the common venting system.

b. **Visually inspect the venting system** for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.

c. **Test vent system** — Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

d. **Place in operation** the appliance being inspected. Follow the operating instructions. Adjust thermostat so appliance will operate continuously.

e. **Test for spillage** at draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.

f. After it has been determined that **each appliance** remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

Any improper operation of common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1–latest edition. Correct by resizing to approach the minimum size as determined using the appropriate tables in Part 11 of that code. Canadian installations must comply with B149.1 or B149.2 Installation Code.

Chimney or vent requirements

1. Venting must be installed according to Part 7, Venting of Equipment, of National Fuel Gas Code, ANSI Z223.1–latest edition and applicable building codes. Canadian installations must comply with B149.1 or B149.2 Installation Codes.

2. See **Ratings** table on page 67 for minimum chimney or vent sizes. A chimney or vent **without a listed cap** should extend **at least 3 feet above the highest point** where it passes through a roof of a building and **at least 2 feet higher** than **any portion of a building within a horizontal distance of 10 feet.** A chimney or vent must not extend less than the distances stated above.

3. A lined chimney is preferred and must be used when required by local, state, provincial and national codes, laws, regulations and ordinances. Vitreous tile linings with joints that prevent retention of moisture and linings made of noncorrosive materials are best. Advice for flue connections and chimney linings can be obtained from local gas utility. **Type B** double-wall metal vent pipe or single-wall vent pipe may be used as a liner.

4. Cold masonry chimneys, also known as outside chimneys, typically have one or more walls exposed to outside air. When any atmospheric gas-fired boiler with automatic vent damper is vented through this type of chimney, the potential exists for condensation to occur. Condensation can damage a masonry chimney. Weil-McLain recommends the following to prevent possible damage.

   a. Line chimney with corrosion-resistant metal liner such as AL29-4C® single-wall stainless steel or B-vent. Size liner per National Fuel Gas Code ANSI Z223.1–latest edition.

   b. Provide drain trap to remove any condensate.

1d Prepare boiler location — contamination

Air contamination

Please review the following information on potential combustion air contamination problems.

Refer to **Table 1** for products and areas which may cause contaminated combustion air.

WARNING

If the boiler is installed in **any area likely to cause contamination**, or if products which would contaminate the air cannot be removed, you must either remove products permanently or isolate the boiler and provide outside combustion air. Contaminated combustion air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage.

Table 1 Corrosive contaminants

Products to avoid	Areas likely to have contaminants
Spray cans containing chloro/fluorocarbons	Dry cleaning/laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes/cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric acid/muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms	Garages with workshops
Adhesives used to fasten building products and other similar products	

1e Prepare boiler location — air openings

Combustion air and ventilation openings must comply with Section 5.3, Air for Combustion and Ventilation , of National Fuel Gas Code ANSI Z223.1–latest edition, or applicable local building codes. Canadian installations must comply with B149.1 or B149.2 Installation Codes.

WARNING Provide adequate combustion and ventilation air to assure proper combustion and reduce the risk of severe personal injury, death or substantial property damage caused by flue gas spillage and carbon monoxide emissions.

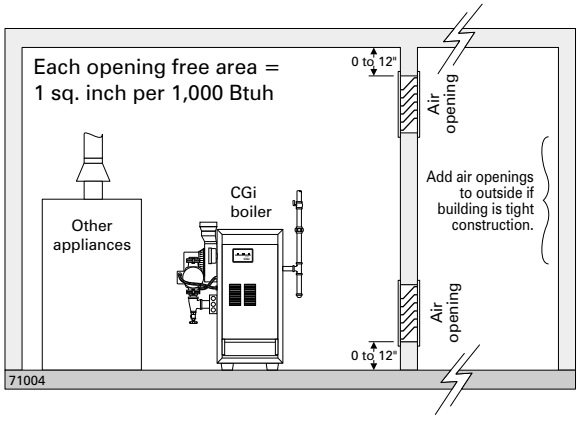
Air from inside building

(boiler in interior room - Figure 3)

1. Tightly constructed buildings must be provided with openings to outside for combustion and ventilation air. These openings must be sized to handle all fuel burning appliances, exhaust or ventilation fans and fireplaces.
2. When openings to boiler room are taken to interior spaces, provide two permanent openings:
   - One air opening within 12 inches of floor.
   - A second opening within 12 inches of ceiling.

   Each opening must provide a minimum free area of **1 square inch per 1,000 Btuh of input** of all appliances in room plus requirements for any exhaust fans in room. The interior space supplying combustion and ventilation air must have adequate infiltration from outside.

Figure 3 Air openings to interior space

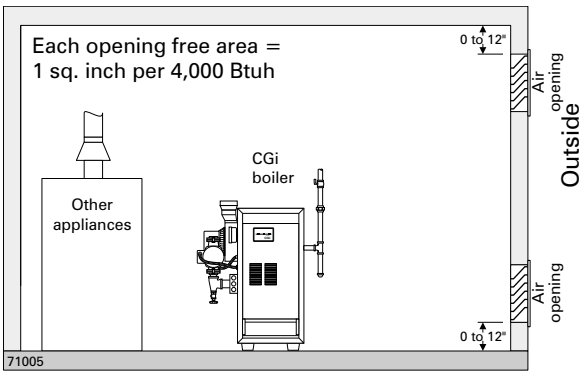


Air directly from outside to boiler room

1. Tightly constructed buildings must be provided with combustion and ventilation air openings to boiler room, which are adequate to handle the boiler needs plus the needs of all other fuel burning appliances, exhaust or ventilation fans and fireplaces.
2. When combustion air is supplied to the boiler space **directly through outside walls (Figure 4)**: Provide two permanent openings:
   - One air opening within 12 inches of floor.
   - A second opening within 12 inches of ceiling.

   Each opening must provide a minimum free area of **1 square inch per 4,000 Btuh of input** of all appliances in room plus requirements for any exhaust fans in room. The interior space supplying combustion and ventilation air must have adequate infiltration from outside.

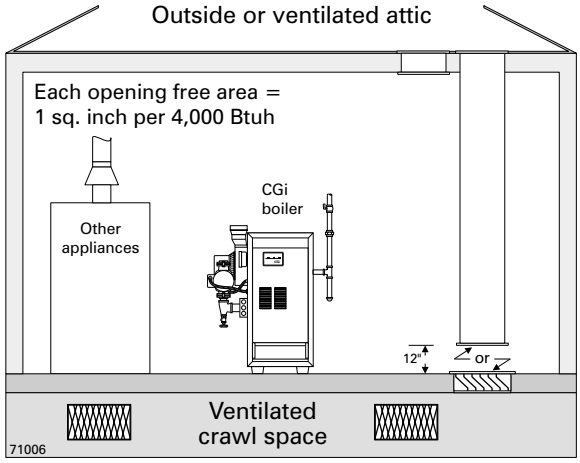
Figure 4 Air directly from outdoors



3. When combustion air is supplied to the boiler space **directly from outside or ventilated attic/ crawl space through vertical ducts (Figure 5)**: Provide two permanent openings:
   - One air opening within 12 inches of floor.
   - A second opening within 12 inches of ceiling.

   Each opening must provide a minimum free area of **1 square inch per 4,000 Btuh of input** of all appliances in room plus requirements for any exhaust fans in room. The duct cross sectional area must be no less than the required area of the permanent openings.

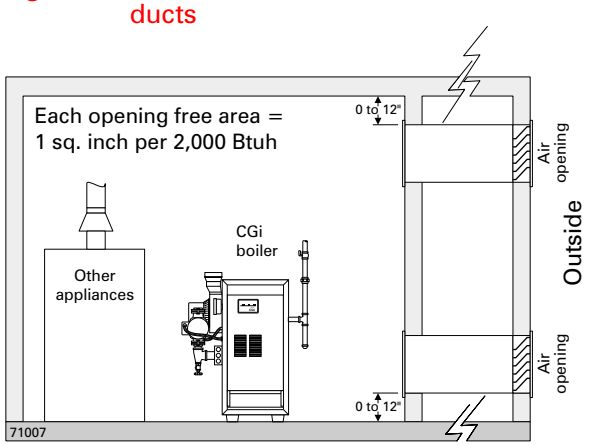
Figure 5 Air from outdoors — vertical ducts



4. When combustion air is supplied to the boiler space **directly from outside through horizontal ducts (Figure 6)**: Provide two permanent openings:
   - One air opening within 12 inches of floor.
   - A second opening within 12 inches of ceiling.

   Each opening must provide a minimum free area of **1 square inch per 2,000 Btuh of input** of all appliances in room plus requirements for any exhaust fans in room. The duct cross sectional area must be no less than the required area of the permanent openings.

Figure 6 Air from outdoors — horizontal ducts



Special considerations

Tight construction

ANSI Z223.1 defines unusually tight construction where:

a. Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings gasketed, and . . .

b. Weather-stripping has been added on openable windows and doors, and . . .

c. Caulking or sealants are applied to areas such as joints around windows and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical, and gas lines, and in other openings.

For buildings with such construction, provide air openings into the building from outside, sized per the appropriate case in **Figure 4** if appliances are to use inside air for combustion and ventilation.

Exhaust fans and air movers

The appliance space must never be under a negative pressure, even if the appliance(s) are installed as direct vent. Always provide air openings sized not only to the dimensions required for the firing rate of all appliances, but also to handle the air movement rate of the exhaust fans or air movers using air from the building or space.

2a Prepare boiler — placement & setup

Place boiler/crate near position

1. Leave boiler in crate and on pallet until installation site is ready.
2. Move entire crate and pallet next to selected location.
3. Remove crate.
4. Remove boiler from pallet.

NOTICE Do not drop boiler or bump jacket on floor or pallet. Damage to boiler can result.

   a. Tilt left side of boiler up and place a board under left legs.
   b. Tilt boiler the other way and place a board under right legs.
   c. Slide boiler backward off pallet and into position.

5. Check level.
   a. Shim legs, if necessary.
   b. Do not alter legs.

Inspect orifices and burners

1. Remove front jacket door. Remove burner shield (see **Figure 40**, item **4**, page 58).
2. Check for correctly-sized manifold orifices. See **Table 2** for sizing. (The orifice size is stamped on the orifice spud barrel.)

DANGER Correctly-sized manifold orifices must be used. Failure to do so will result in severe personal injury, death or substantial property damage.

3. Reinstall burner shield.

WARNING Do not operate boiler without burner shield in place. Failure to do so could result in severe personal injury, death or substantial property damage.

Orifice replacement procedure
(when required)

1. Remove the screws securing the burner shield and remove burner shield.
2. Using a 7/16" open-end wrench, remove the burner orifices from the manifold.
3. Apply a small amount of pipe dope to each of the new orifices and install in the manifold using a 7/16" open-end wrench. Make sure the orifices are aligned correctly, not cross-threaded in the manifold tappings.

WARNING Use only pipe dope compatible with propane gas, even if boiler is to be operated on natural gas. Failure to comply could result in severe personal injury, death or substantial property damage.

4. Carefully replace the burner shield.
5. Follow the check-out procedure, section **8** page 36, to assure the boiler is now operating properly after orifices are replaced.

Table 2 Manifold orifice sizing at sea level and altitudes to 4,500 feet

Location	Boiler model number	Natural gas		Propane gas	
		0-2,000 ft	over 2,000 ft	0-2,000 ft	over 2,000 ft
U. S.	CGi-25	2.30 mm	(Note 1)	#54	(Note 1)
	CGi-3 — CGi-8	2.70 mm		1.65 mm	
Canada		0-2,000 ft	2,000-4,500	0-2,000 ft	2,000-4,500
	CGi-25	2.30 mm	#44	#54	#55
	CGi-3 — CGi-8	2.70 mm	#38	1.65 mm	#53

Note 1: For elevations above 2,000 feet, contact your local Weil-McLain sales office for details.

2b Prepare boiler — pressure test

Perform hydrostatic pressure test

Pressure test boiler **before** attaching water or gas piping (except as noted below) or electrical supply.

Prepare boiler for test

1. Remove the shipping nipple (from CGi supply tapping) and remove the boiler relief valve. **Temporarily** plug the relief valve tapping with a ¾" NPT pipe plug.
2. Remove 1¼" nipple, reducing tee and drain valve from circulator hardware and pressure/temperature gauge carton. Install in boiler return connection as shown on page 3 and **Figure 42**, page 60. Install circulator on either the return or supply.
3. Remove 1¼" nipple, 1¼" x 1¼" x ½" tee and pressure/temperature gauge from circulator hardware and pressure/temperature gauge carton. Pipe to boiler supply connection as shown on page 3 and **Figure 42**, page 60. (Use pipe dope sparingly.)
4. Connect a hose to boiler drain valve, the other end connected to a fresh water supply. Make sure hose can also be used to drain boiler after test.
5. Connect a nipple and shutoff valve to system supply connection on the 1¼" tee. This valve will be used to bleed air during the fill. (Valve and nipple are not included with boiler.)
6. Connect a nipple and shutoff valve to system return connection (at circulator flange if circulator installed on return). This valve will be used to bleed air during the fill. (Valve and nipple are not included with boiler.)

Fill and pressure test

1. Open the shutoff valves you installed on supply and return connections.
2. Slowly open boiler drain valve and fresh water supply to fill boiler with water.
3. When water flows from shutoff valves, close boiler drain valve.
4. Close shutoff valves.
5. Slowly reopen boiler drain valve until test pressure on the pressure/temperature gauge reaches no more than:
   - **45 psig** for boilers with **30 psig relief valve**.
   - **75 psig** for boilers with **50 psig relief valve**.
6. **Test for no more than 10 minutes at**:
   - **45 psig** for boilers with **30 psig relief valve**.
   - **75 psig** for boilers with **50 psig relief valve**.

WARNING **Do not leave boiler unattended.** A cold water fill could expand and cause excessive pressure, resulting in severe personal injury, death or substantial property damage.

7. Make sure constant gauge pressure has been maintained throughout test. Check for leaks. Repair if found.

WARNING **Leaks must be repaired at once.** Failure to do so can damage boiler, resulting in substantial property damage.

DANGER Do not use **petroleum-based** cleaning or sealing compounds in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

Drain and remove fittings

1. Disconnect fill water hose from water source.
2. Drain boiler at drain valve or out hose, whichever provides best access to drain. Remove hose after draining if used to drain boiler.
3. Remove nipples and valves unless they will remain for use in the system piping.
4. Remove plug from relief valve tapping. See section **4a**, page 20 to replace relief valve.

3a Venting — general information

CGi venting methods

The CGi boiler can be vented using one of the following methods:

1. **Chimney draft venting** — Uses the natural draft provided by a vertical vent or chimney. Category I appliance (non-positive vent static pressure and vent gas temperature that avoids excessive condensate production in vent). See section **3b**, below. Chimney draft installations use:
   a. Vent connector (single or doublewall) sized to eliminate positive pressure in vent system. Diameter increases immediately at boiler.
   b. Doublewall metal vent (B-vent) or chimney with liner approved by the National Fuel Gas Code, ANSI Z223.1–latest edition, or in Canada B149.1 or B149.2 Installation Code.
2. **Direct exhaust — vertical or sidewall** — Uses inside combustion air with no combustion air connector piping. All CGi flue gas vents are pressurized, requiring careful sealing of all joints. Category III appliance (positive vent static pressure and vent gas temperature that avoids excessive condensate production in vent). See pages 15-19. Direct exhaust installations use:
   a. Vent pipe specified in this manual.
   b. Vent termination through outside wall, roof or unused chimney. Tight chimney areas will make vent joint construction very difficult.

3b Venting — chimney draft venting

Table 3 Vent connector diameter

Boiler model number	"D" Minimum vent connector diameter
CGi-25 & CGi-3	4"
CGi-4 to CGi-8	5"

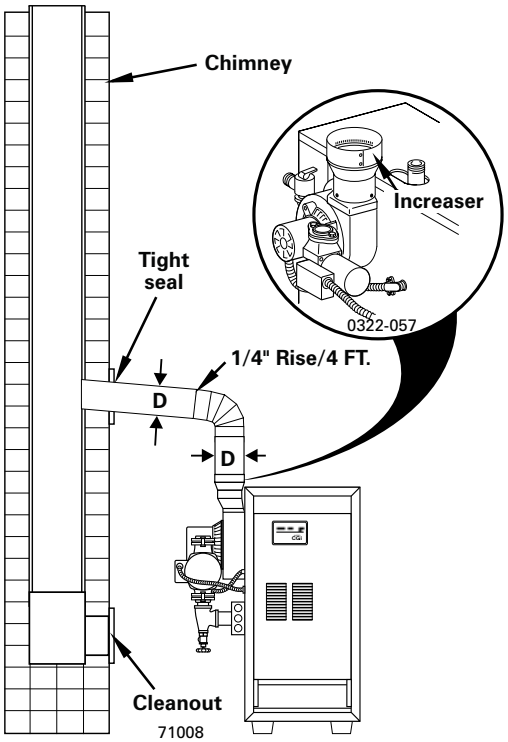
DANGER

Inspect existing chimney before installing boiler. Failure to clean or replace perforate pipe or lining will cause severe personal injury or death.

WARNING

Vent sizing given in **Table 3** is only a general guideline. The vent connector and chimney must be designed, sized and constructed in compliance with all applicable codes. Failure to correctly size and install the vent system could result in severe personal injury, death or substantial property damage.

Figure 7 Chimney draft venting



1. Use doublewall metal vent (B-vent) or chimney with liner as required by the National Fuel Gas Code, ANSI Z223.1–latest edition, or in Canada, B149.1 or B149.2 Installation Code.
2. To prevent downdrafts, chimney should extend at least 3 feet above the highest point where it passes through a roof and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet.
3. To vent with another appliance, see National Fuel Gas Code, ANSI Z223.1–latest edition or in Canada B149.2 or B149.2 Installation Code
4. Do not connect breeching to any portion of a mechanical draft system that can operate under positive pressure.
5. Maintain minimum 2" clearance from combustible materials to vent pipe.
6. Do not use chimney with an open fireplace.
7. Make horizontal runs as short as possible. Long runs can cause condensation.
8. When longer runs are used, support pipe with appropriate hangers.
9. To prevent blockage, do not vent into bottom of chimney.
10. Vent pipe must not go beyond inside wall of chimney.
11. Vent passing through floors or ceilings must be firestopped.
12. See **Figure 7** and **Table 3** to connect boiler to venting system.

3c Venting — direct exhaust — system components

Obtain vent system components

1. The following special gas vent systems comply with UL-1738 and ULC-S636 standards and are certified by CSA as the only systems suitable for use with CGi boilers (all 3" diameter):
   - Heat-Fab, Inc. **Saf-T Vent®**
   - Flex-L International, Inc. **StaR-34**
   - Z-Flex®, Inc. **Z-Vent II**
   - ProTech Systems **FasNSeal™**

WARNING Use only the vent starter of the same manufacturer as the vent components. Do not mix components from different systems. The vent system could fail, causing flue gas spillage, resulting in severe personal injury or death.

2. Select vent method based on page 14 and installation requirements.
3. Refer to **Table 4** for maximum vent run lengths and number of elbows. Do not exceed data in **Table 4**.
4. Select vent components from **Table 5**. All components, including the vent starter, must be of the same vent manufacturer. Do not mix components.

Table 4 Maximum vent length

Max.vent length (feet)	Total number of elbows (Note 1)					
	1	2	3	4	5	6
CGi-25 to CGi-6	55	48	41	34	27	20
CGi-7	35	28	21	14	7	--
CGi-8	28	21	14	7	--	--
Note 1:	Do not include termination fitting when counting total number of elbows.					

Table 5 Vent system components

Description	Saf-T Vent®		StaR-34	Z-Vent II	FasNSeal™
	Weil-McLain part number	Saf-T Vent® part number			
CGi Starter	699-999-015	73WMCGIS	SRAWCG3	SVEWMFA03	FSA-WEIL-CGI
Termination Coupling with Screen	699-999-001	73WMTERM	--	SVSTPX03	FSB3S
Termination Elbow with Screen	699-999-069	1314TERM	SRTE-03	SVSTEX0390	FSTE90
Termination Tee with Screen	699-999-026	7390TEE	SRTT-03	SVSTTX03	FSTT3
45˚ Elbow	699-999-010	7311GC	SRE4503	SVEEWC0345	FSEL4503
90˚ Elbow	699-999-011	7314GCTR	SRE9003	SVEEWC0390	FSEL9003
6" Pipe	699-999-003	7301GC	SR06P03	SVEPWC03.5	FSVL603
12" Pipe	699-999-004	7302GC	SR12P03	SVEPWC0301	FSVL1203
18" Pipe	699-999-005	7304GC	--	SVEPWC0318	FSVL1803
24" Pipe	699-999-006	7305GC	SR24P03	SVEPWC03	FSVL2403
36" Pipe	--	--	SR36P03	SVEPWC0303	FSVL3603
37 ½" Pipe	699-999-007	7307GC	--	--	--
48" Pipe	--	--	--	SVEPWC0304	--
49 ½" Pipe	699-999-008	7308GC	--	--	--
60" Pipe	699-999-012	7360GC	SR60P03	SVEPWC0305	--
Slip Connector (See Note)	699-999-009	7324GC9	SRSJ03	--	--
Horizontal Support	699-999-016	7323GC	--	--	FSSH
Horizontal Drain Tee	699-999-014	7320GC	SRTDH03	SVEDWC03	FSHDT3
Joiner Band	--	--	SRJB-14	--	--
Sealant	As specified by individual vent pipe manufacturer				Not required
Note: Use to adjust for non-standard pipe lengths and Saf-T Vent® only, before termination coupling to terminate run.					

3d Venting — direct exhaust — vent starter

1. Select a vent pipe manufacturer and obtain all vent components needed, based on boiler location and venting method.
2. You must use the vent starter made by the vent pipe manufacturer. See **Table 5**, page 15, **Vent system components**, for part number of each component, listed by vent manufacturer.

WARNING Use only the vent starter of the same manufacturer as the vent components. Do not mix components from different systems. The vent system could fail, causing flue gas spillage, resulting in severe personal injury or death.

3. Follow all applicable national, state, local or provincial codes when venting the CGi boiler.
4. Connect vent starter to blower housing outlet as shown in the **Figures 8** through **11**, below.
   a. Do not mix components from different vent manufacturers.
   b. Maintain minimum 2" clearance from combustible materials to vent pipe.
   c. Seal with sealant specified by vent pipe manufacturer, using ⅜" bead (not required for FasNSeal™).
   d. Tighten strap at band clamp screw until strap is snug around blower housing.

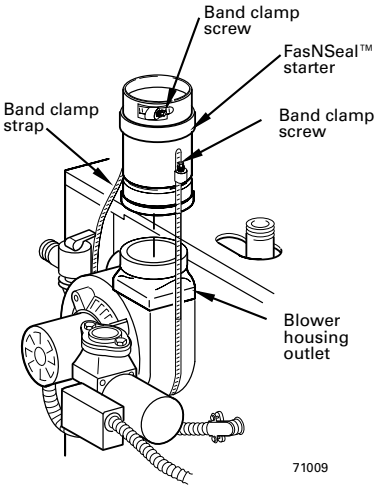


Figure 8

FasNSeal™ vent starter

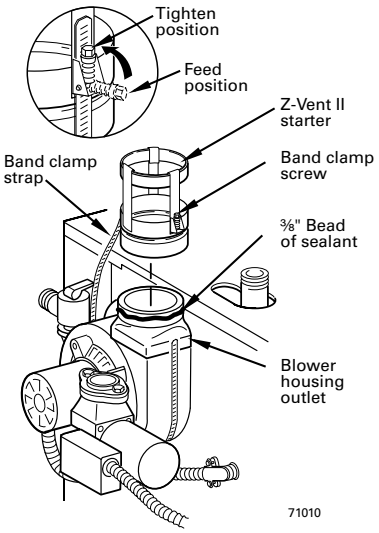


Figure 9

Z-Vent II vent starter

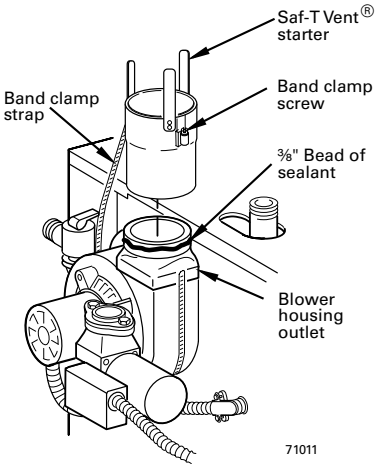


Figure 10

Saf-T Vent® vent starter

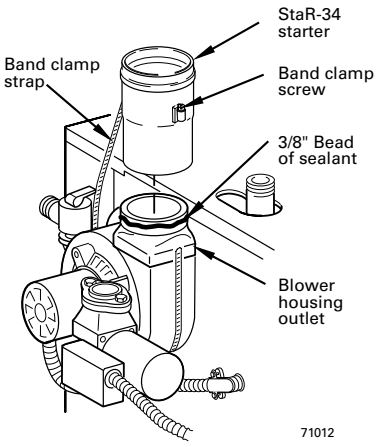


Figure 11

StaR-34 vent starter

3e Venting — direct exhaust — vent termination

WARNING

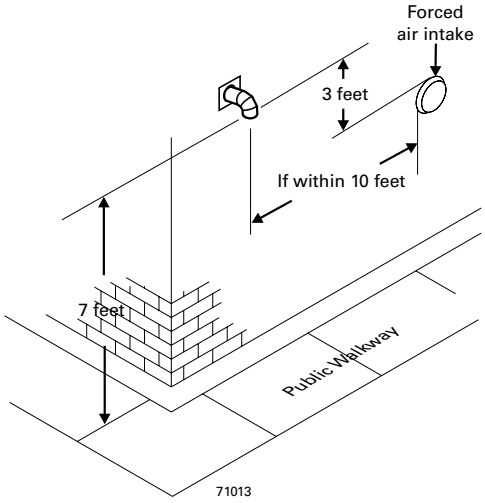
Follow instructions on this page when determining vent location to avoid possibility of severe personal injury, death or substantial property damage.

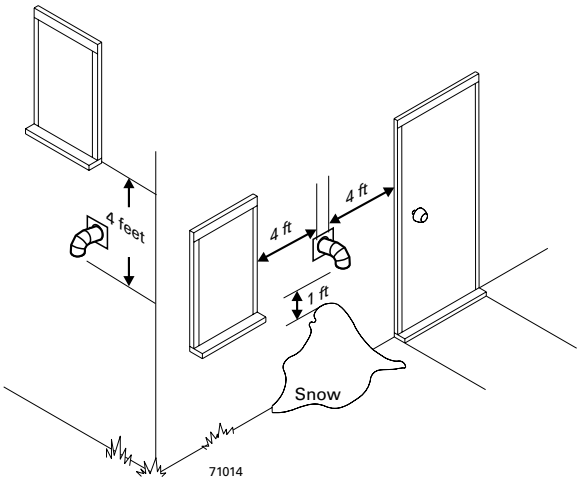
1. Locate the boiler and vent penetration through the wall so all requirements on this page and in Figure 12 will be met. Also follow vent manufacturer's instructions.
2. Gases will form white plume in winter. Plume could obstruct window view.
3. Prevailing winds could cause freezing of condensate and water/ice buildup on vent termination, building, plants or roof. Ice buildup on vent termination can cause boiler shutdown and building freezeup.
4. Winds over 31 mph can cause nuisance boiler shutdown if boiler is sidewall vented. This could result in loss of heat to building, causing freezeup.
5. Locate or guard vent termination to prevent condensate from damaging exterior surfaces.
6. Locate the vent termination well away from trees, shrubs, and decorative items.
7. Locate or guard vent to prevent accidental contact by people or pets.
8. Do not terminate vent in window well, stairwell, alcove, courtyard, or other recessed areas.
9. Do not wrap or insulate vent pipe or fittings.
10. Do not terminate vent above any door or window. Condensate can freeze, causing ice formations.
11. Do not connect:
    - Any other appliance to vent pipe.
    - Multiple boilers to a common vent pipe.
12. Canadian installations — See B149.1 or B149.2 Installation Code. Terminate vent no less than 6 feet from another combustion air inlet, 3 feet from any other building opening, and 3 feet from any gas service regulator.
13. See **Figure 12**, showing that the vent must terminate:
    - more than 4 feet below or to side of all doors or windows.
    - more than 1 foot above grade or anticipated snow line.
    - at least 7 feet above public walkway.
    - 3 feet above any forced air intake within 10 feet.
14. Vent must also terminate:
    - at least 6 feet away from adjacent walls.
    - no closer than 5 feet below roof overhang.
    - at least 4 feet horizontally (and in no case above or below unless a 4 foot horizontal distance is maintained) from electric meters, gas meters, regulators, relief valves, and other equipment.
15. Site conditions may dictate greater clearances.
16. Do not extend exposed vent pipe outside of building. Condensate could freeze and block vent pipe.

WARNING

A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below building extensions such as eaves, parapets, balconies or decks. Failure to comply could result in severe personal injury, death or substantial property damage.

Figure 12 Vent termination minimum clearances





3f Venting — direct exhaust

1. Do not mix types or manufacturers of vent materials.

2. Clean all joints before sealing. See vent manufacturer's instructions for cleaning and sealing joints. Use their specified sealant. Do not use screws.

3. Install vent pipe with seams on top of vent horizontal runs. Follow requirements in section **3e**, page 17, for vent termination.

4. Maintain minimum 2" clearance from combustible materials to vent pipe.

5. **Vertical venting** — See **Figure13**. Follow vent manufacturer's instructions for venting through roof.
   - Vent pipe must extend through roof flashing, jacket or thimble.
   - Vent may pass through floor, inside wall or concealed space when installed according to vent manufacturer's instructions.

   Sidewall venting — See **Figures 14 and 15**. Vent must terminate at least one foot above anticipated snowline. Vent must be terminated only with:
   - Tee or elbow with integral screen. (Tee may be mounted either vertically or horizontally. **DO NOT** use horizontal tee with CGi-7 or CGi-8.)
   - Elbow and termination coupling with screen (not available for StaR-34).

6. Do not seal vent pipe (slip connector for Saf-T Vent) to inside or outside plate.

7. If passing through noncombustible wall, provide hole diameter large enough to insert the vent pipe (slip connector for Saf-T Vent).

8. Install horizontal drain tee as close as possible to boiler, in first horizontal run. See **Figure 13**.

9. Do not exceed the maximum vent system length given in **Table 4**, page 15.

WARNING Condensate drain line — use only silicone tubing rated for at least 400 °F for the condensate drain line. Using any other material could cause flue gas leakage, potentially resulting in severe personal injury, death or substantial property damage.

CAUTION On some installations, the condensate drain fitting may be omitted, provided:

- Vent manufacturer shows this option in their instructions.
- Vent is sloped toward termination as shown in dotted lines in **Figure 14**.
- The vent is installed per Weil-McLain and vent manufacturer's instructions.

Condensate drippage from such vents may accumulate on the ground below. Consider traffic in the area to avoid hazard due to ice accumulation.

Figure 13 Direct exhaust vertical venting

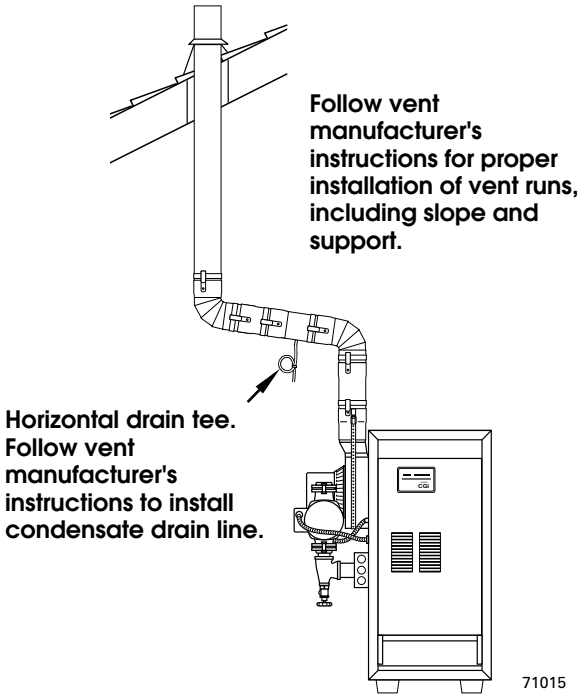
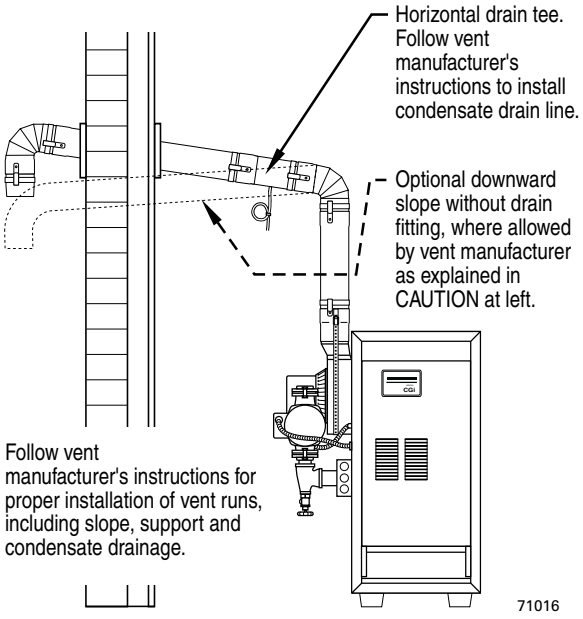

Follow vent manufacturer's instructions for proper installation of vent runs, including slope and support.
Horizontal drain tee. Follow vent manufacturer's instructions to install condensate drain line.
71015

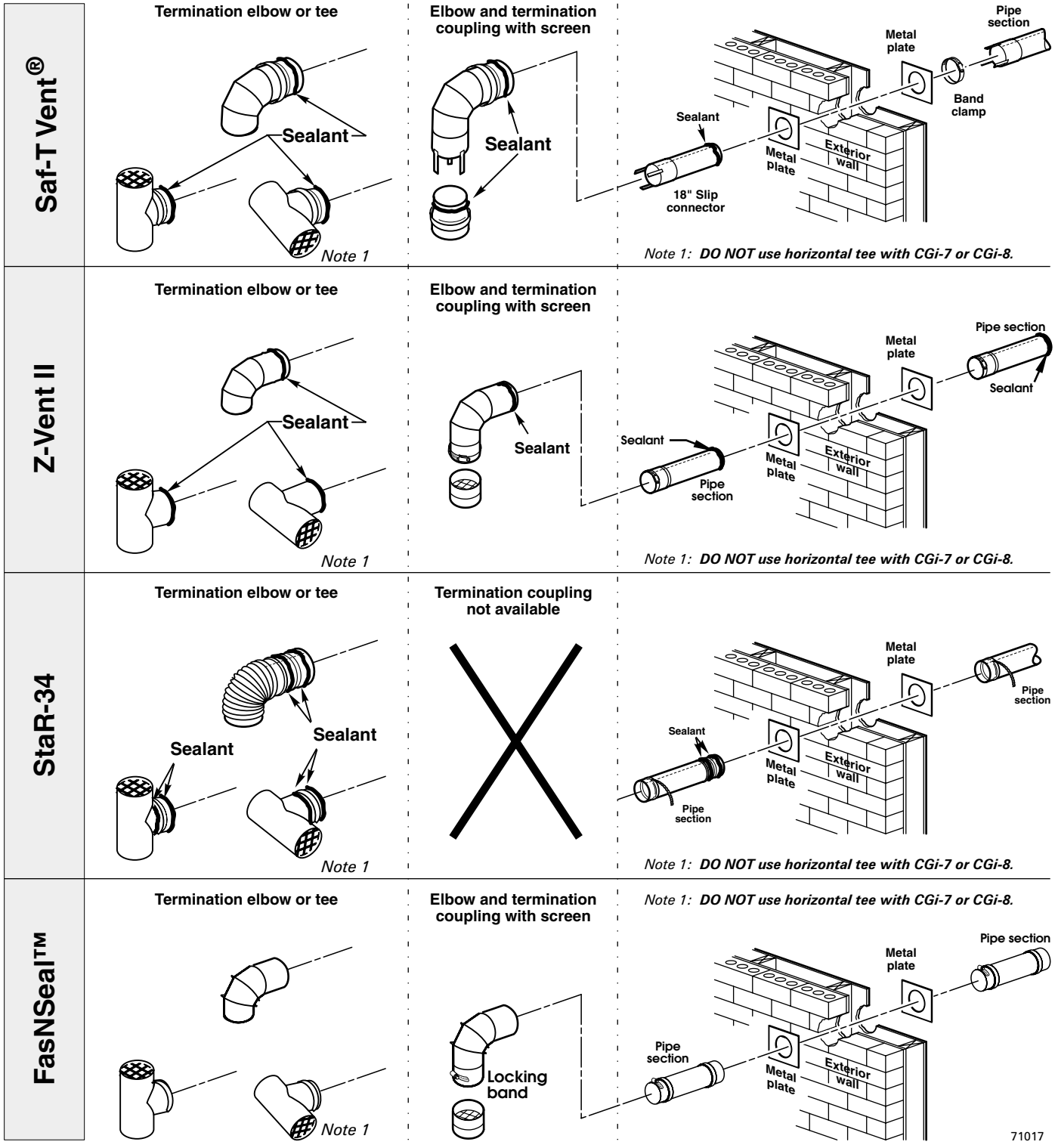
Figure 14 Direct exhaust sidewall venting


Horizontal drain tee. Follow vent manufacturer's instructions to install condensate drain line.
Optional downward slope without drain fitting, where allowed by vent manufacturer as explained in CAUTION at left.
Follow vent manufacturer's instructions for proper installation of vent runs, including slope, support and condensate drainage.
71016

vertical or sidewall

WARNING Using any termination other than one of those shown could cause nuisance outages and loss of heat, resulting in substantial property damage.

Figure 15 Sidewall termination



4a Water piping — general information

General piping information

If installation is to comply with ASME or Canadian requirements, an additional **high temperature limit** is needed. Install control in supply piping between boiler and isolation valve. Set second control to minimum 20 °F above setpoint of first control. Maximum allowable setpoint is 240 °F. See section **9b**, pages 38 and 39, for wiring.

A **low water cutoff device** is required when boiler is installed above radiation level or by certain state or local codes or insurance companies. Use low water cutoff designed for water installations. Electrode probe-type is recommended. Purchase and install in tee in supply piping above boiler.

Use **backflow check valve** in cold water supply as required by local codes.

Pressure/temperature gauge

Install pressure/temperature gauge in tee on supply piping (as shown in drawing on page 3). The gauge well is a self-closing valve, allowing removal of the gauge without draining the system.

WARNING Slowly remove pressure/temperature gauge from well. The self-closing valve could leak if clogged with sediment. If water begins to spray, stop removing gauge. Close system fill valve and drain enough water to release system pressure before continuing with gauge removal. Escaping hot water could cause severe personal injury.

Relief valve

Install relief valve vertically in ¾" tapping on side of boiler. See **Figure 16 or 17** and the tag attached to the relief valve for manufacturer's instructions.

WARNING To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and **run to a safe place of disposal**. Terminate the discharge line to eliminate possibility of severe burns should the valve discharge.
- Discharge line must be as short as possible and be the **same size as the valve discharge connection** throughout its entire length.
- Discharge line must **pitch downward** from the valve and terminate at least 6" above the floor drain where any discharge will be clearly visible.
- The discharge line shall **terminate plain, not threaded,** with a material serviceable for temperatures of 375 °F or greater.
- **Do not pipe the discharge to any place where freezing could occur.**
- **No shutoff valve** shall be installed between the relief valve and boiler, or in the discharge line. Do not plug or place any obstruction in the discharge line.
- **Failure to comply** with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.
- **Test the operation of the valve** after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.

Circulator

The circulator is shipped loose (wiring pre-attached to boiler) to allow you to locate it either in the return or supply piping, as desired. See page 3 for a typical installation. Pipe the expansion tank to the suction side of the circulator whenever possible. Install an air separator in the supply piping. Connect the expansion tank to the air separator only if the separator is on the suction side of the circulator. Always install the system fill connection at the same point as the expansion tank connection to the system. **Figures 16** and **17** show typical near-boiler piping connections.

System water piping

See **Figure 16** (diaphragm-type or bladder-type expansion tank) or **Figure 17** (closed-type expansion tank) on page 21, and **Table 6** below, for near-boiler and single-zone systems designed for return water at least 130 °F.

See pages 22-23 to complete multiple-zone piping or pages 24-29 to complete piping for radiant heating systems or converted gravity systems.

Refer to page 29 for boilers used with refrigeration systems.

Table 6 Water pipe size (based on 20 °F rise)

Boiler model number	To system	From system
CGi-25	¾"	¾"
CGi-3	1"	1"
CGi-4	1"	1"
CGi-5	1"	1"
CGi-6	1 ¼"	1 ¼"
CGi-7	1 ¼"	1 ¼"
CGi-8	1 ½"	1 ½"

Note: Circulator flange supplied with boiler is same size as recommended piping above.

WARNING Install boiler such that —

- Chilled medium, if used, is piped in parallel with heating boiler. Use appropriate valves to prevent chilled medium from entering boiler. Consult I=B=R Installation and Piping Guides.
- If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, use flow control valves or other automatic means to prevent gravity circulation during cooling cycle. Circulation of cold water through the boiler could result in damage to the heat exchanger, causing possible severe personal injury, death or substantial property damage.

4b Water piping — single-zone system

Expansion tank

Diaphragm-type or bladder-type expansion tank — Figure 16

1. Ensure expansion tank size will handle boiler and system water volume and temperature. Tank must be located in boiler return piping as close to boiler as possible, before inlet side of circulator. See tank manufacturer's instructions for details.
2. Install an **automatic air vent** as shown.

Closed-type expansion tank — Figure 17

1. Ensure expansion tank size will handle boiler and system water volume and temperature. See tank manufacturer's instructions for details.
2. Connect tank to ½" NPT tapping located behind supply outlet, using ½" NPT piping. Pitch any horizontal piping up towards tank 1 inch per 5 feet of piping.

CAUTION Undersized expansion tanks cause system water to be lost from relief valve and makeup water to be added through fill valve. Eventual section failure can result.

WARNING Use **Figure 16** or **Figure 17** only for single-zone systems designed for return water at least 130 °F. For systems with low return water temperature possible, such as converted gravity systems and radiant heating systems, refer to the special piping suggestions of pages 24-29. Failure to prevent low return water temperature to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Figure 16 Diaphragm- or bladder-type expansion tank

Piping to single-zone system using diaphragm-type or bladder-type expansion tank. See **Table 6** for piping sizes.

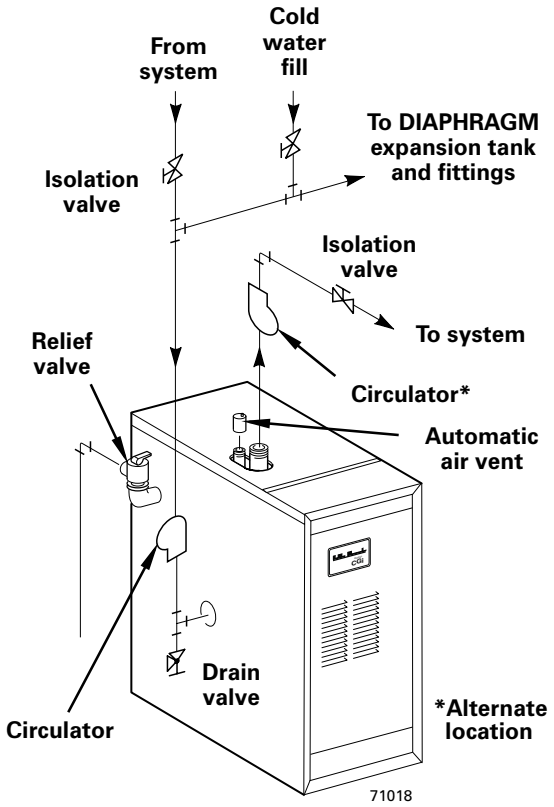
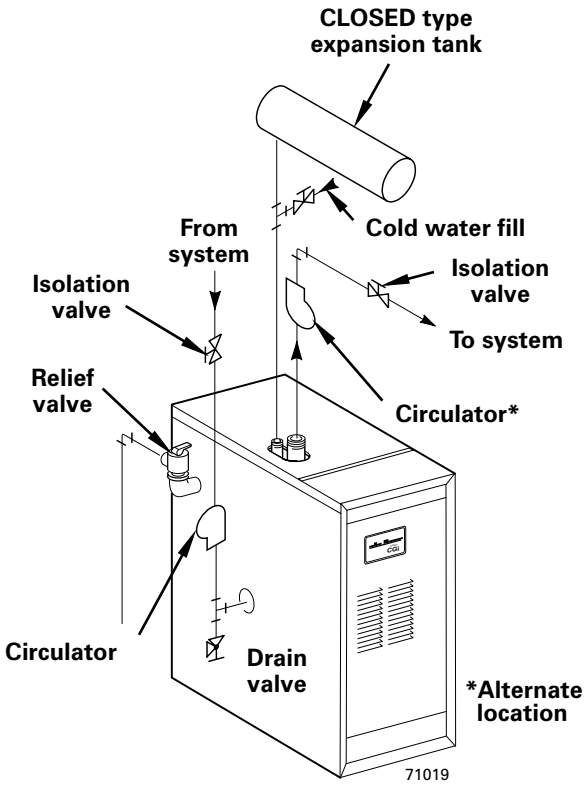


Figure 17 Closed-type expansion tank

Piping to single-zone system using closed-type expansion tank. See **Table 6** for piping sizes.



4c Water piping — multiple zones

Piping multiple zones

Follow instructions on pages 20 and 21 to install near-boiler or single-zone piping. (Also refer to **Piping for radiant heating systems or converted gravity systems**, below, if applicable.)

See **Figure 18** or **Figure 19** to complete installation.

Zoning with circulators, return temp over 130 °F

1. Size each circulator to individual circuit requirements.
2. Do not install circulator on boiler (except for primary/secondary piping).
3. Install isolation (balancing) valves to adjust flow to distribute heat to all zones.
4. Install and wire a separate relay for each zone circulator.

Zoning with zone valves, return temp over 130 °F

1. Install isolation (balancing) valves to adjust flow to distribute heat to all zones.
2. Provide a separate 24-volt transformer to power the zone valves. Size the transformer to handle the total rated load of all connected zone valves.

Piping for radiant heating systems or converted gravity systems

Converted gravity (or steam) systems

Whenever possible, use the primary/secondary piping shown in **Figures 20 or 21** on page 25. This piping design allows changing boiler flow rate without affecting primary circuit flow rate.

If **Figures 20 or 21** cannot be used, use the boiler-bypass piping shown in **Figure 22 or Figure 23** on page 27. You can also use the piping shown in **Figure 24** on page 29 (system-bypass), if the reduced flow rate in the heating system will not cause heat distribution problems.

WARNING

Failure to prevent low return water temperature to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating systems

Preferably, use primary/secondary piping, as shown in **Figures 20 or 21** on page 25. Alternatively, use the method of either **Figure 22 or Figure 23** on page 27. **Do not use the piping of Figure 24** (system-bypass), because this method does not control radiant system supply temperature.

If radiant system tubing has no oxygen barrier, a **heat exchanger** must be used.

WARNING

Radiant heating system piping should include a means of regulating the boiler return water temperature **and** the system supply temperature (such as provided by an injection pumping control). Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the system supply temperature is relatively constant.

Do not apply the methods in this manual if the system is equipped with an **outdoor reset control**. Instead, provide controls and piping which can regulate the boiler return water temperature at no less than 130 °F regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods. Failure to prevent cold return water temperature to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

typical piping — multiple-zone installations

Figure 18

Zoning with circulators
— return water 130 °F or higher.

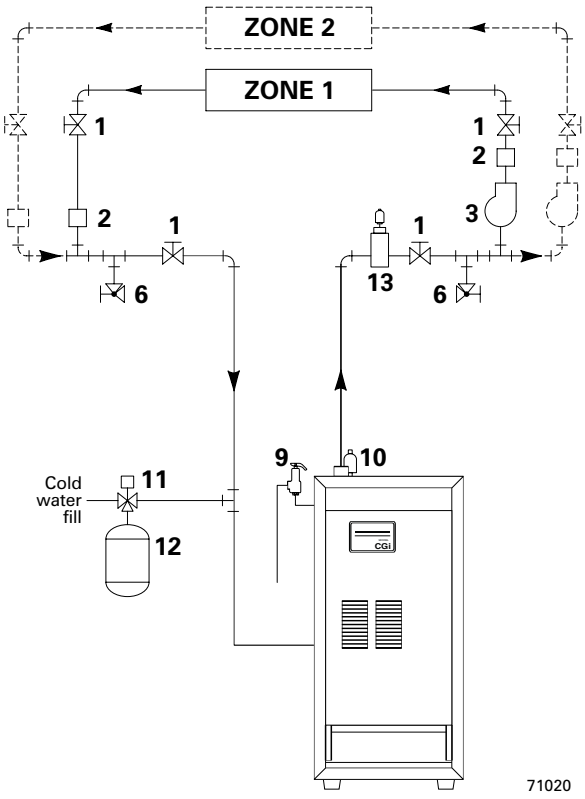
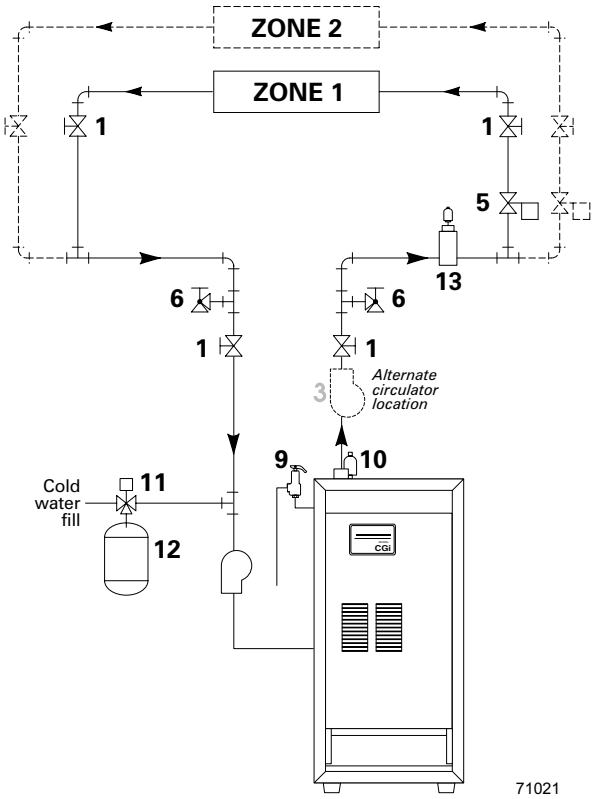


Figure 19

Zoning with zone valves
— return water 130 °F or higher.



1 Boiler isolation (balancing) valves

2 Flow/check valve

3 System or zone circulator

5 Zone valve

6 Drain valve

9 Relief valve

10 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.

11 Fill valve

12 Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 17**.)

13 Air separator and automatic vent, if used (Note that the fill valve must always be connected to the expansion tank, regardless of location of expansion tank circulator or air separator.

WARNING

For systems with possible low return-water temperature (such as converted gravity systems, radiant heating systems and heat pump systems), refer to the special piping suggestions of **Figures 20 - 24**, as applies. Failure to prevent sustained low return water temperature to the boiler could cause corrosion of the boiler sections, resulting in severe personal injury, death or substantial property damage.

4d Water piping — low temp systems

Primary/secondary (preferred) bypass piping method

Primary/secondary bypass piping is preferred because the flow rate and temperature drop in the heating circuit(s) is determined only by the heating circuit circulator(s). So adjustment of the bypass valves in the boiler circuit will not cause a change in the heating circuit rate and temperature distribution.

Figures 20 and 21 show suggested bypass arrangements using **primary/secondary** bypass piping (preferred) for low temperature systems such as **radiant heating systems** or **converted gravity systems**. For alternatives, see pages 26 through 29.

The bypass valves (items **7a** and **7b**) provide mixing of hot boiler outlet water with cooler system return water — set to assure a minimum return water temperature (at least 130 °F) to the boiler. Set the valves as explained below.

Temperature gauges

Gauge **4a** is suggested, but optional on any system.

Gauge **4b** is optional on converted gravity systems, but **required** on radiant heating systems — to display the water temperature being supplied to the radiant tubing.

Gauge **8** is **required** on all systems to assure the return water temperature is accurately set for a minimum of 130 °F. If this gauge is not available however, adjust the valves such that the boiler-mounted temperature/pressure gauge reads at least 150 °F when the system return water is cold (approximately 60 °F water temperature).

Valve adjustment (Figure 20 and 21 only)

1. Set the valves while the system is cool, setting for the coldest expected water temperature (usually 60 °F since the system will often drop to room temperature between cycles).
2. Start with valve **7a** fully closed and **7b** fully open.
3. Gradually open valve **7a** while closing valve **7b** until the temperature at gauge **8** reads 130 °F when gauge **4a** reads 60 °F.
4. Note that valve **7a** regulates the amount of hot water from the boiler supply which mixes with return water. Valve **7b** regulates the amount of system water flowing through the boiler secondary loop.

WARNING

Failure to **prevent low return water temperature** to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating system piping should include a means of **regulating the boiler return water temperature** and the **system supply temperature** (such as provided by an **injection pumping control**).

Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the **system supply temperature is relatively constant**.

DO NOT apply the methods of this manual if the system is equipped with an **outdoor reset control**. Instead, **provide controls and piping** which can **regulate the boiler return water temperature** at **no less than 130 °F** regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods.

Failure to **prevent cold return water temperature** to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

primary/secondary (preferred) bypass piping —
for radiant heating or converted gravity systems

Figure 20

Zoning with circulators

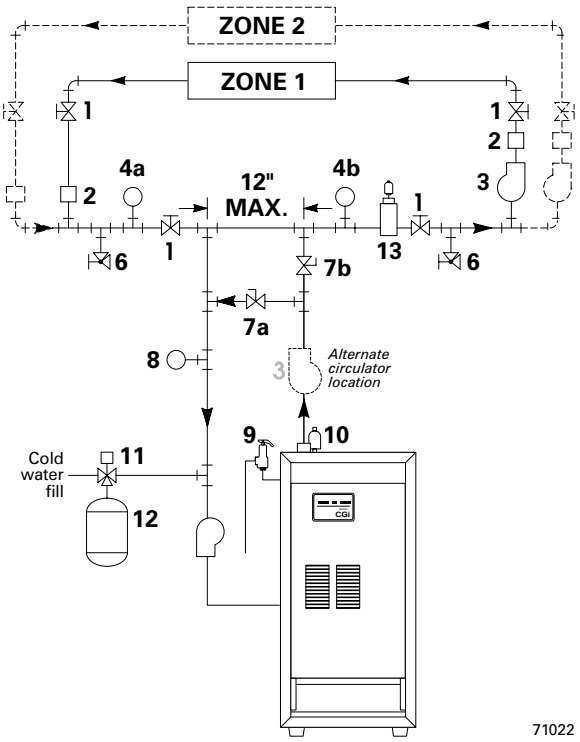
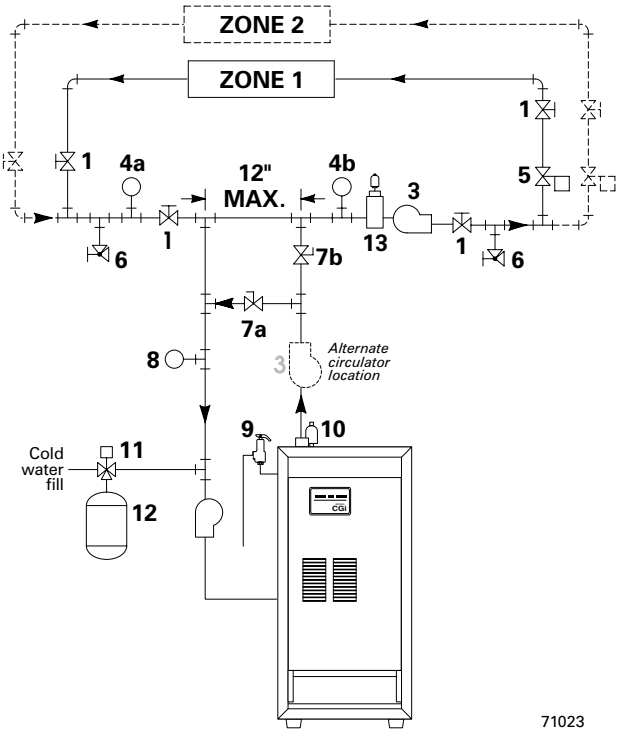


Figure 21

Zoning with zone valves



1 Boiler isolation (balancing) valves

2 Flow/check valve

3 System or zone circulator

4 System temperature gauges

5 Zone valve

6 Drain valve

7 System temperature valves (see instructions to the left for adjusting valves)

8 Blend temperature gauge

9 Relief valve

10 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.

11 Fill valve

12 Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 17**.)

13 Air separator and automatic vent, if used (Note that the fill valve must always be connected to the expansion tank, regardless of location of expansion tank, circulator or air separator.)

4e Water piping — low temp systems

Boiler-bypass piping method

This piping method is called a **boiler-bypass** because part of the circulator flow is bypassed around the boiler (through valve **7a**). This method reduces the flow rate throughout the boiler, in order to raise the average water temperature in the boiler enough to prevent flue gas condensation. Boiler-bypass piping is effective for some boilers — including the CGi — provided the flow rates are adjusted according to the instructions following.

Figures 22 and 23 are alternative piping suggestions for **converted gravity** (large water content or steam systems) or **radiant heating system** — for use when primary/secondary piping can't be applied. (**Figure 24** is another alternative, using system bypass in place of boiler-bypass piping. **Figure 24** however, is not suitable for radiant heating applications because it does not protect the radiant system from possible high water temperature.)

Boiler-bypass piping keeps system flow rate as high as possible and temperature drop as low as possible, helping to equalize the building heat distribution.

Temperature gauges

Gauge **4a** is optional if the bypass valves will be adjusted using cold (or room temperature) return water to the boiler. (When setting the valves without gauge **4a** installed — using cold or room temperature water — assume the return water temperature to be 60 °F. Set the valves so gauge **8** reads at least 120 °F.

Gauge **4b** is optional on converted gravity systems, but **required** on radiant heating systems — to display the water temperature being supplied to the radiant tubing.

Gauge **8** is **required** on all systems to assure reliable adjustment of the bypass valves. The boiler-mounted temperature/pressure gauge can be used if a separate temperature gauge is not installed.

Valve adjustment

1. Start with valve **7a** fully closed and **7b** fully open.
2. Gradually open valve **7a** while closing valve **7b** until the temperature at gauge **8** reads 60 °F higher than gauge **4a**. A minimum 60 °F temperature rise through the boiler assures a low enough flow rate and high enough average temperature to prevent condensation even with low system return water temperature.
3. Valve **7a** regulates the system flow rate, while valve **7b** regulates the boiler flow rate.
4. The boiler-mounted temperature/pressure gauge may be used in place of a separate gauge **8**.

WARNING

Failure to **prevent low return water temperature** to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating system piping should include a means of **regulating the boiler return water temperature** and the **system supply temperature** (such as provided by an **injection pumping control**).

Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the **system supply temperature** is **relatively constant**.

DO NOT apply the methods of this manual if the system is equipped with an **outdoor reset control**. Instead, **provide controls and piping** which can **regulate the boiler return water temperature** at **no less than 130 °F** regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods.

Failure to **prevent cold return water temperature** to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

boiler-bypass (alternate) piping —
for radiant heating or converted gravity systems

Figure 22 Boiler-bypass piping

Zoning with circulators

(Alternative to primary/secondary piping **Figures 20 and 21**)

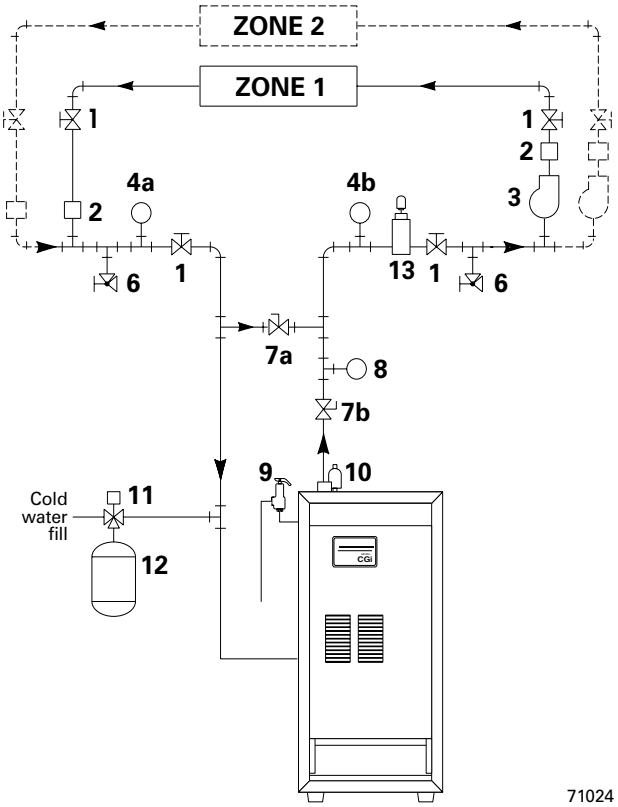
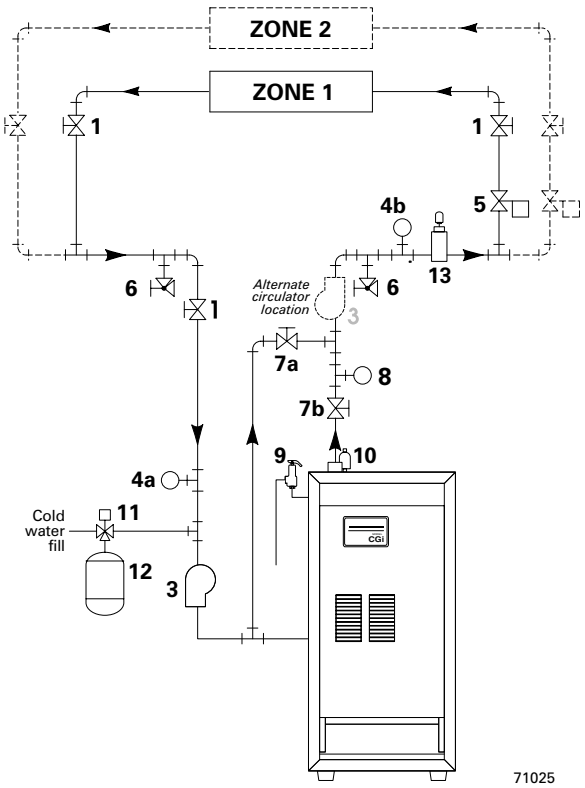


Figure 23 Boiler-bypass piping

Zoning with zone valves

(Alternative to primary/secondary piping **Figures 20 and 21**)



1 Boiler isolation (balancing) valves

2 Flow/check valve

3 System or zone circulator

4 System temperature gauges

5 Zone valve

6 Drain valve

7 System temperature valves (see instructions to the left for adjusting valves)

8 Blend temperature gauge

9 Relief valve

10 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.

11 Fill valve

12 Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 17,** page 21).

13 Air separator and automatic vent, if used (Note that the fill valve must always be connected to the expansion tank, regardless of location of expansion tank, circulator or air separator.)

4f Water piping — low temp systems

System-bypass piping method

This piping method is called a **system-bypass** because part of the circulator flow bypasses the system (through valve **7a**). This bypassed hot water from the boiler outlet mixes with cooler system return water temperature in order to provide minimum 130 °F return water to the boiler. Valve **7b** will most often be full open, but may need to be slightly closed on some low pressure drop systems in order to cause enough flow through valve **7a**.

Figure 24 is an alternative piping method that provides return water temperature control for boilers installed on **converted gravity systems** (large water content or steam systems).

Do not apply the piping of **Figure 24** on **radiant heating systems**. It provides no method regulating the water temperature provided to the system and could result in excessive water temperature in the radiant tubing.

System-bypass piping as shown in **Figure 24** can be used with either zone valve or circulator zoning. When used with circulator zoning however, the boiler circulator (item **3**), must be piped as shown. It cannot be used as one of the zoning circulators.

Do not apply system-bypass piping if the reduced flow in the system could cause poor heat distribution. That is, system-bypass piping reduces the flow in the system and increases the water temperature supplied to the system. This can cause increased heat from radiators at the beginning of the system and reduced heat from radiators near the end of the system.

Valve adjustment

1. Start with valve **7a** fully closed and **7b** fully open.
2. Gradually open valve **7a** while closing valve **7b** until the temperature at gauge **8** reads at least 130 °F at all times.
3. Valve **7a** regulates the amount of boiler supply water mixed with return water. Valve **7b** causes a pressure drop in the system needed to balance flow through valve **7a** and the system.
4. The valve adjustment should be done with the system at the coldest expected temperature (60 °F for converted gravity systems or high mass radiant systems).

WARNING

Failure to **prevent low return water temperature** to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating system piping should include a means of **regulating the boiler return water temperature** and the **system supply temperature** (such as provided by an **injection pumping control**).

Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the **system supply temperature** is **relatively constant**.

DO NOT apply the methods of this manual if the system is equipped with an **outdoor reset control**. Instead, **provide controls and piping** which can **regulate the boiler return water temperature** at **no less than 130 °F** regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods.

Failure to **prevent cold return water temperature** to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

4f system-bypass (alternate) piping — for converted gravity (or steam) systems

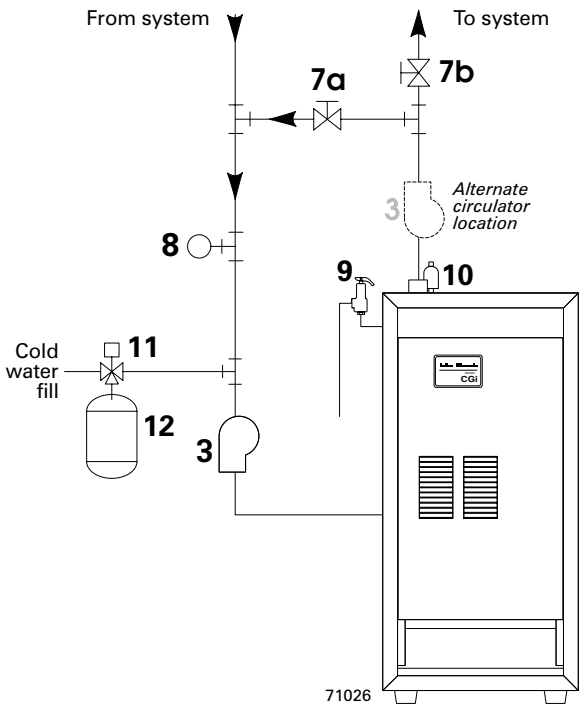


Figure 24 System-bypass piping

Zoning with zone valve or circulators, return water 130 °F or higher.

(Alternative to boiler-bypass piping **Figures 22 and 23**)

3 System or zone circulator

7 System temperature valves (see instructions to the left for adjusting valves)

8 Blend temperature gauge

9 Relief valve

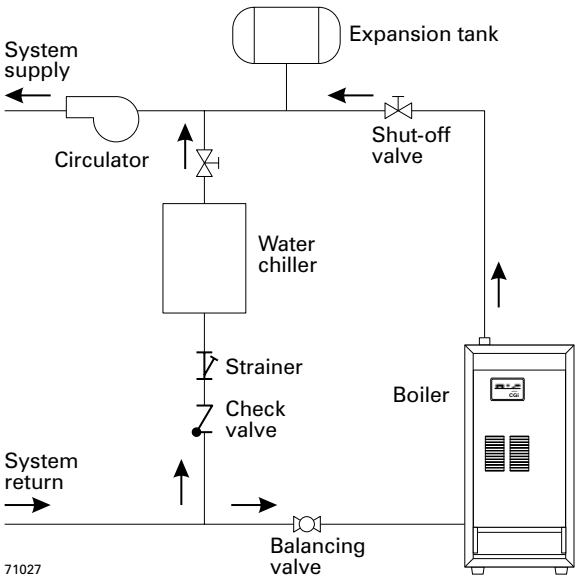
10 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.

11 Fill valve

12 Diaphragm-type or bladder-type expansion tank, if used (For closed-type expansion tank, pipe from top of air separator to tank fitting as in **Figure 17**.)

4g Water piping — refrigeration system

Figure 25 Piping refrigeration systems



Prevent chilled water from entering boiler

Install boiler so that chilled medium is piped in parallel with the heating boiler. Use appropriate valves to prevent chilled medium from entering boiler. See **Figure 25** for typical installation of balancing valve and check valve.

If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, use flow control valves or other automatic means to prevent gravity circulation during cooling cycle.

5 Gas piping

Connecting gas supply piping to boiler

1. Remove jacket front panel and refer to **Figure 26** to pipe gas to boiler.
   a. **Install drip leg** at inlet of gas connection to boiler. Where local utility requires drip leg to be extended to the floor, use appropriate length of pipe between cap and tee.
   b. **Install ground joint union** for servicing, when required.
   c. **Install manual shutoff valve** in gas supply piping outside boiler jacket when required by local codes or utility requirements.
   d. **In Canada** — When using manual main shutoff valve, it **must be identified** by the installer.
2. **Support piping** with hangers, not by boiler or its accessories.
3. **Purge all air** from gas supply piping.
4. Before placing boiler in operation, **check boiler and its gas connection for leaks.**
   a. **Close manual main shutoff valve** during any pressure testing at less than 13" w.c.
   b. **Disconnect boiler and gas valve from gas supply piping** during any pressure testing greater than 13" w.c.

WARNING **Do not check for gas leaks with an open flame** — use bubble test. Failure to use bubble test or check for gas leaks can cause severe personal injury, death or substantial property damage.

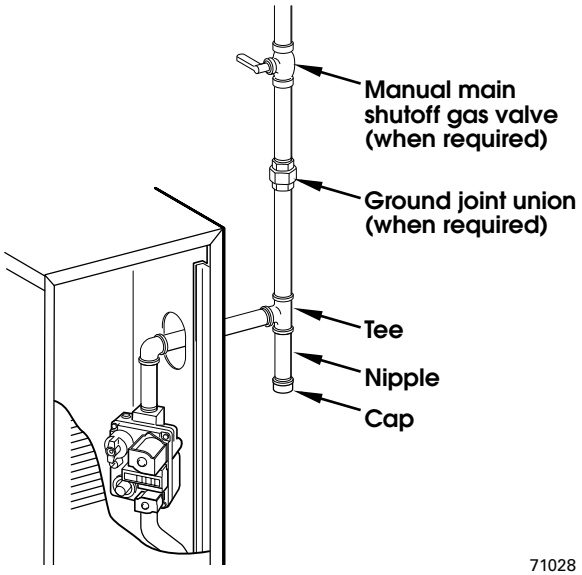
5. **Use pipe dope compatible with propane gases.** Apply sparingly only to male threads of pipe joints so that pipe dope does not block gas flow.

WARNING **Failure to apply pipe dope** as detailed above can result in severe personal injury, death or substantial property damage.

Table 7 Pipe capacity for 0.60 specific gravity natural gas

Gas pipe length (feet)	Capacity of pipe for pipe size of: (Capacity in cubic feet gas per hour)				
	½"	¾"	1"	1¼"	1½"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	860
40	63	130	245	500	760
50	56	115	215	440	670
75	45	93	175	360	545
100	38	79	150	305	460
150	31	64	120	250	380

Figure 26 Gas supply piping



Natural Gas:

1. Refer to **Table 7** for pipe length and diameter. Base on rated boiler input (divide by 1,000 to obtain cubic feet per hour). **Table 7** is only for gas with **specific gravity 0.60, with a pressure drop through the gas piping of 0.30" w.c.** For additional gas pipe sizing information, refer to ANSI Z223.1 (or B149.1 or B149.2 for Canadian installations).
2. Inlet pressure required at gas valve inlet:
   • Maximum: 13" w.c.
   • Minimum: 5" w.c.
   • Manifold gas pressure: 3.5" w.c.
3. Install 100% lockup gas pressure regulator in supply line **if inlet pressure exceeds 13" w.c.** Adjust for 13" w.c. maximum.

Propane Gas:

1. Contact gas supplier to size pipes, tanks and 100% lockup gas pressure regulator.
2. Adjust propane supply regulator provided by gas supplier for 13" w.c. maximum pressure.
3. Inlet pressure required at gas valve inlet:
   • Maximum: 13" w.c.
   • Minimum: 11" w.c.
   • Manifold gas pressure: 10" w.c.

6 Field wiring

WARNING

For your safety, **turn off electrical power supply at service entrance panel before making any electrical connections** to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

NOTICE

Wiring must be N.E.C. Class 1.

If original rollout thermal fuse element wire as supplied with boiler must be replaced, use only type **200 °C** wire or equivalent. If other original wiring as supplied with boiler must be replaced, type **105 °C** wire or equivalent must be used.

Boiler must be **electrically grounded** as required by National Electrical Code ANSI/NFPA 70–latest edition.

Electrical installation must comply with:

1. National Electrical Code and any other national, state, provincial or local codes or regulations.
2. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

Wiring connections

Boiler is shipped with controls completely wired.

Thermostat

1. Connect thermostat as shown on wiring diagram on boiler.
2. **Install on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, sunrays, or fireplaces.**
3. If thermostat has a heat anticipator, set heat anticipator in thermostat to match power requirements of equipment connected to it. If connected directly to boiler, set for 0.1 amps plus gas valve current. See information on wiring diagram as shown in **Figure 32**, page 39. For other devices, refer to manufacturer's specifications. Wiring diagram on boiler gives setting for control module and gas valve. Also see instructions with thermostat.

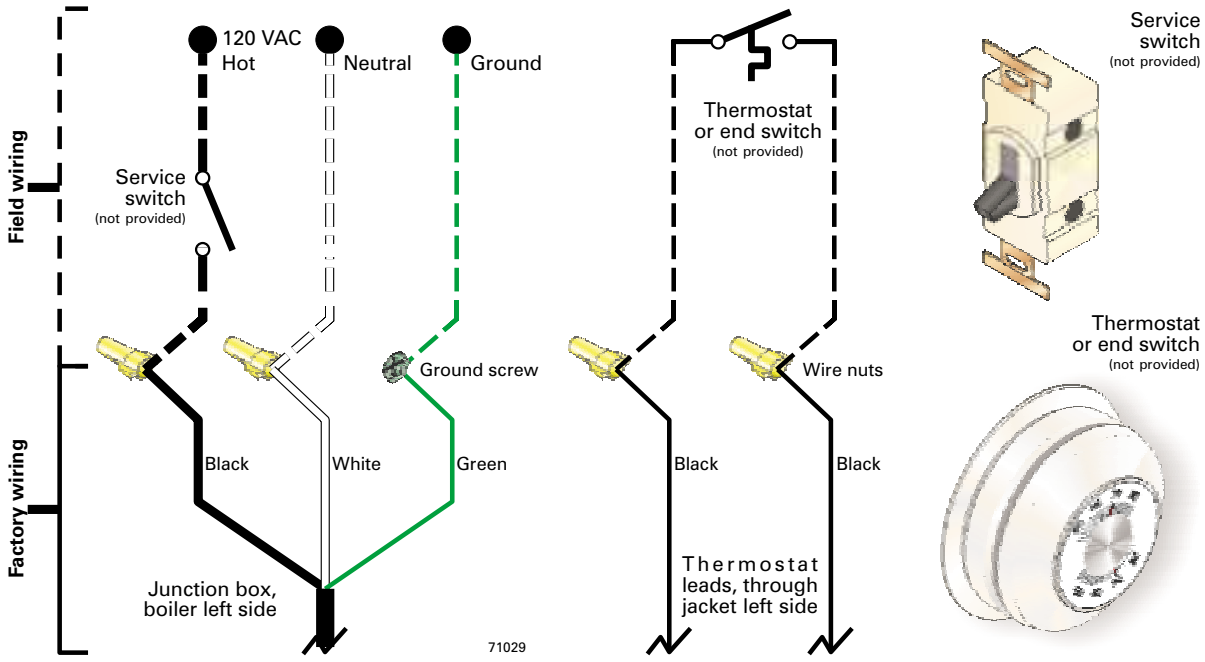
Junction Box (furnished)

1. Connect 120 VAC power wiring as shown in **Figure 27.**
2. Fused disconnect or service switch (15 amp. recommended) may be mounted on this box. For those installations with local codes which prohibit installation of fused disconnect or service switch on boiler, install a 2 x 4 cover plate on the boiler junction box and mount the service switch remotely as required by the code.

Figure 27 Field wiring connections — service switch and thermostat (or end switch) provided by installer

NOTICE

The CGi control module is polarity-sensitive. The hot and neutral wires must be connected to the correct leads. A flashing **POWER** light usually indicates reversed polarity of 120 VAC lead wires.



7a Start-up — preparation

Check for gas leaks

WARNING

Propane boilers only — Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade and the gas may no longer have an odor.

- Propane gas can accumulate at floor level. Smell near the floor for the gas odorant or any unusual odor. If you suspect a leak, do not attempt to light the pilot.
- Use caution when attempting to light the propane pilot. This should be done by a qualified service technician, particularly if pilot outages are common.
- Periodically check the odorant level of your gas.
- Inspect boiler and system at least yearly to make sure all gas piping is leak-tight.
- Consult your propane supplier regarding installation of a gas leak detector. There are some products on the market intended for this purpose. Your supplier may be able to suggest an appropriate device.

WARNING

Before starting the boiler, and during initial operation, smell near the floor and around the boiler for gas odorant or any unusual odor. Do not proceed with start-up if there is any indication of a gas leak. Repair any leak at once.

Determine if water treatment is needed

DANGER

Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

WARNING

Eliminate all system leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure.

Verify water chemistry

Consult local water treatment companies for unusually hard water areas (above 7 grains hardness) or low pH water conditions (below 7.0). Boiler water pH of 7.0 to 8.5 is recommended.

Freeze protection (when used)

Use antifreeze made especially for hydronic systems. Inhibited propylene glycol is recommended.

WARNING

Do not use **ethylene glycol, automotive or undiluted antifreeze**. Severe personal injury or death can result.

1. Determine **antifreeze quantity** according to system water content. Boiler water content is listed on page 63. Remember to include expansion tank water content.
2. Follow antifreeze manufacturer's instructions.
3. A 50% solution of propylene glycol/water provides maximum protection to about -30 °F.
4. Local codes may require **back flow preventer** or actual disconnect from city water supply.
5. When using antifreeze in a system with automatic fill, install a water meter to monitor water makeup. Glycol will leak before the water begins to leak, causing glycol level to drop. Added water will dilute the antifreeze, reducing the freeze protection level.

Fill the system with water

1. Close manual and automatic **air vents** and boiler drain cock.
2. **Fill to correct system pressure.** Correct pressure will vary with each application. Typical cold water fill pressure for a residential system is 12 psi.
3. **Purge air** from system:
   a. Connect a hose to the purge valve (see ***drain valves***, item **6**, in suggested piping diagrams on pages 21 through 27, **Figure 16** through **Figure 23**). Route hose to an area where water can drain and be seen.
   b. Close the boiler or system isolation valve between the purge valve and fill connection to the system.
   c. Close zone isolation valves.
   d. Open quick-fill valve on cold water makeup line.
   e. Open purge valve.
   f. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the air. Run until no noticeable air flow is present. Close the zone isolation valves and proceed with the next zone. Follow this procedure until all zones are purged.
   g. Close the quick-fill water valve and purge valve and remove the hose. Open all isolation valves. Watch that system pressure rises to correct cold-fill pressure.
   h. After the system has operated for a while, eliminate any residual air by using the manual air vents located throughout the system.
   i. If purge valves are not installed in system, open manual air vents in system one at a time, beginning with lowest floor. Close vent when water squirts out. Repeat with remaining vents.
4. Open **automatic air vent** (diaphragm-type or bladder-type expansion tank systems only) one turn.
5. Open other vents:
   a. Starting on the lowest floor, open air vents one at a time until water squirts out.
   b. Repeat with remaining vents.
6. Refill to correct pressure.

Inspect system water piping

After filling the boiler and system with water, **inspect all piping** throughout the system for leaks. If found, repair immediately. Repeat this inspection after the boiler has been started and the system has heated up.

WARNING **Leaks must be repaired at once.** Failure to do so can damage the boiler, resulting in substantial property damage.

DANGER Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

Inspect base insulation

Check to make sure **insulation is secure** against all four sides of the base. If insulation is damaged or displaced, **do not** operate boiler. Replace or reposition insulation.

WARNING **Failure to replace** damaged insulation or reposition insulation can result in a fire hazard, causing severe personal injury, death or substantial property damage.

WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 64** of this manual. Failure to comply could result in severe personal injury.

7b Start-up — operate boiler

Final check before starting boiler

- Read manual section **9**, page 37, including the **Operating instructions** procedure (**Figure 33**, page 40).
- Verify the boiler and system are **full of water**.
- Verify the **Start-up preparation** procedures of section **7a** have been completed.

Start the boiler

- Follow the **Operating instructions** from section **9c** to start the boiler.
- See section **7c** if boiler fails to start.

Check system and boiler

DANGER Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

WARNING **Eliminate all system leaks.** Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure.

WARNING Glycol or antifreeze leaks around the boiler may result in fire, causing severe personal injury, death or substantial property damage.

1. **Check system piping for leaks.** If found, shut down boiler and repair immediately.
2. **Vent air from system** using manual vents. Air in the system will interfere with circulation and cause heat distribution problems and noise.
3. **Inspect vent system** thoroughly for signs of deterioration from corrosion, physical damage or sagging. In addition — Check for gas-tight seal at every connection and seam.

WARNING **Venting system must be sealed gas-tight** to prevent flue gas spillage and carbon monoxide emissions which will result in severe personal injury or death.

4. **Check around the boiler** for gas odor following the procedure of section **7a**, page 32 of this manual.

WARNING If you discover evidence of any gas leak, shut down the boiler at once. Find the leak source with bubble test and repair immediately. Do not start boiler again until corrected. Failure to comply could result in severe personal injury, death or substantial property damage.

Check burner flames

View pilot and main flames through the inspection port in the base burner shield.

Pilot burner flame

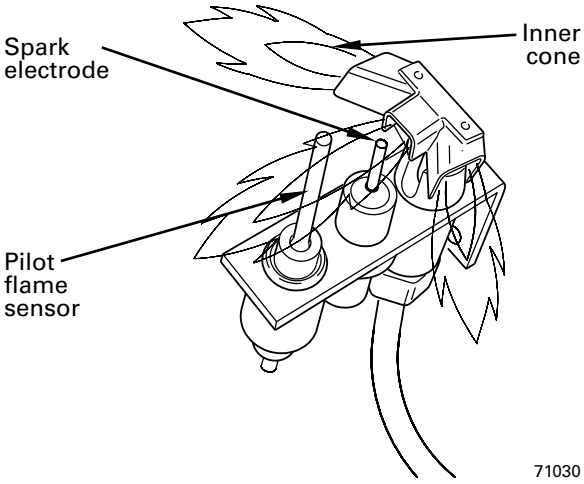
Proper pilot flame characteristics (see **Figure 28**):

1. Blue flame.
2. Inner cone engulfing pilot flame sensor.
3. Pilot flame sensor glowing cherry red.

Improper pilot flame characteristics:

1. Overfired — Large flame lifting or blowing past pilot flame sensor.
2. Underfired — Small flame. Inner cone not engulfing pilot flame sensor.
3. Lack of primary air — Yellow flame tip.
4. Incorrectly heated pilot flame sensor.

Figure 28 Typical pilot burner flame



Main burner flame

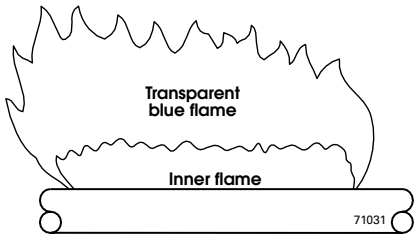
Proper main burner flame characteristics (see **Figure 29**):

1. Yellow-orange streaks may appear (caused by dust).

Improper main burner flame characteristics:

1. Overfired — Large flames.
2. Underfired — Small flames.
3. Lack of primary air — Yellow tipping on flames (sooting will occur).

Figure 29 Typical main burner flame



7c Start-up — if boiler doesn't start . . .

Check for:

1. Loose connections, blown fuse or service switch off?
2. High limit switch set below boiler water temperature?
3. Thermostat set below room temperature?
4. Gas not turned on at meter or boiler?
5. Incoming gas pressure less than:
   5" w.c. for natural gas?
   11" w.c. for propane gas?

If none of the above corrects the problem, refer to **Troubleshooting**, section **11**, pages 46-55 of this manual.

8 Check-out procedure — checklist

- ❑ Boiler and heat distribution units filled with water?
- ❑ Automatic air vent, if used, open one full turn?
- ❑ Air purged from system?
- ❑ Air purged from gas piping? Piping checked for leaks?
- ❑ Correctly sized manifold orifices installed? Refer to **Table 2**, page 12, to check size and fuel type.

DANGER Correctly sized manifold orifices must be used. Failure to do so will cause severe personal injury, death or substantial property damage.

- ❑ Followed operating instructions on boiler or in manual section **9**, pages 37-40 for proper start-up?
- ❑ Proper burner flame observed? Refer to **Check burner flame**, manual section **7b**, page 35.
- ❑ Test limit control — While burners are operating, move indicator on limit control below actual boiler water temperature. Burners should go off while circulator continues to operate. Raise setting on limit control above boiler water temperature and burners should reignite.
- ❑ Test additional field-installed controls — If boiler has a low water cutoff, additional high limit or other controls, test for operation as outlined by manufacturer. Burners should be operating and should go off when controls are tested. When controls are restored, burners should reignite.
- ❑ Test ignition system safety device:
  a. Connect manometer to outlet side of gas valve.
  b. Start boiler, allowing for normal start-up cycle to occur and main burners to ignite.
  c. With main burners on, manually shut off gas supply at manual main shutoff gas valve. Burners should go off.
  d. Open manual main shutoff gas valve. Manometer should confirm there is no gas flow.
  e. Pilot will relight, flame sensing element will sense pilot flame and main burners will reignite.
- ❑ Set limit control(s) to system temperature requirements. Adjust balancing valves and controls to provide design temperature to system.
- ❑ For multiple zones, adjust flow so it is about the same in each zone.
- ❑ Verify thermostat heat anticipator (if available) set properly? Refer to **Field wiring**, manual section **6**, page 31, **Thermostat(s)**.
- ❑ Cycle boiler with thermostat — Raise to highest setting and verify boiler goes through normal start-up cycle. Lower to lowest setting and verify boiler goes off.
- ❑ Measure natural gas input:
  a. Operate boiler 10 minutes.
  b. Turn off other appliances.
  c. At natural gas meter, measure time (in seconds) required to use one cubic foot of gas.
  d. Calculate gas input:

$$\frac{3600 \times 1000}{\text{number of seconds from step } \mathbf{c}} = \text{Btuh}$$

  e. Btuh calculated should approximate input rating on boiler rating label.
- ❑ Check manifold gas pressure by connecting manometer to downstream test tapping on main gas valve. Manifold pressure for natural gas should be 3.5" w.c. and for propane gas should be 10" w.c.
- ❑ Observe several operating cycles for proper operation.
- ❑ Set room thermostat to desired room temperature.
- ❑ Fill in Installation and service certificate below?
- ❑ Review all instructions shipped with this boiler with owner or maintenance person. Return instructions to envelope and give to owner or place in pocket inside front panel in boiler.

Installation and service certificate

Boiler model _____ Series _____ CP number _____ Date installed _____

Measured Btuh input _____

- ❑ Installation instructions have been followed.
- ❑ Check out sequence has been performed.
- ❑ Above information is certified to be correct.
- ❑ Information received and left with owner/maintenance person

Installer _____ (company) _____ (address) _____ (phone)

_____
(installer's signature)

9a Operation — sequence

1. **Read Operating instructions** on page 40. This information is also located on a label on the inside of the boiler jacket door panel.
2. **Raise** room thermostat to call for heat.
3. **Inducer and circulator energize.** After pressure switch proves proper airflow, control module initiates 30-second prepurge.
4. **Control module sparks** the pilot and opens pilot valve in main gas valve.
   a. If pilot **does not** light within 15 seconds, pilot valve is closed and spark generator is turned off. Control module initiates a 15-second postpurge, then starts a new cycle.
   b. If pilot **does** light and control module senses flame current, spark generator is turned off and main valve opens.
5. **During main burner operation:**
   a. Control module monitors pilot flame current. **If signal is lost**, main valve closes, spark generator activates and sequence returns to step **4**.
   b. **If power is interrupted**, control system **shuts off** pilot and main gas valves and restarts at step **1** when power is restored.
6. In the event the **limit control shuts down the boiler** — The control module closes the pilot and main gas valves, but keeps the inducer operating for 15-second postpurge.
   — The circulator continues to operate.
7. **Lower** room thermostat setting to stop call for heat. Thermostat is satisfied — Pilot and main gas valves are closed — Inducer operates for 15-second postpurge — Circulator is shut off.
8. Boiler is now in the **off cycle**.
9. **Repeat** steps **1** through **6** several times to verify operation.
10. **Return** the thermostat to normal setting.
11. Set thermostat heat anticipator setting as instructed in **Figure 32**, page 39.

Figure 30 Control module sequence of operation — status light indications

Steps (Following step 8, cycle goes back to step 1.)	Call for heat?	POWER	TSTAT CIRC	LIMIT	PRESS SWITCH	FLAME	Timing
1. Standby · Waiting for call for heat	NO	☀	◠	◠	◠	◠	—
2. Call for heat · Circulator on · Blower on	YES	☀	☀	◠	◠	◠	—
3. Limit circuit · Limit controls closed · Rollout TFE contacts closed	YES	☀	☀	☀	◠	◠	—
4. Pressure circuit · Pressure switch contacts closed · Prepurge for 30 seconds	YES	☀	☀	☀	☀	◠	35 sec
5. Pilot flame proven * · Gas valve open · Pilot remains on · Boiler producing heat	YES	☀	☀	☀	☀	☀	15 sec
6. Limit cycle · Limit circuit open · Gas valve closed	YES	☀	☀	◠	◠	◠	—
7. Flame outage * · Flame out · Boiler recycles	YES	☀	☀	☀	☀	◠	—
8. Thermostat satisfied · Circulator off · Blower postpurge	NO	☀	◠	☀	☀	◠	15 sec
9. Circulator exercise routine · Circulator turns on for 30 seconds if boiler not operated for 30 days	NO	☀	◠	◠	◠	◠	30 sec
		☀ or ☀ = "ON"			◠ = "OFF"		

* If pilot flame is not proven in 15 seconds, control module will flash the FLAME light, but will continue indefinitely with attempts to light the pilot burner. The control module will not lockout on a failure to establish flame. It will lockout if line voltage polarity is reversed, stray voltage is sensed on thermostat line, pressure switch sticks closed or fails to make within 5 minutes or if flame is sensed when it shouldn't be there. The boiler will reset after these lockouts if any of the following occurs:
• 1 hour waiting period • Opening and closing of thermostat circuit • Removal of 120 VAC power for at least 45 seconds. 71032

9b Operation — wiring diagrams

Figure 31 Schematic wiring diagram

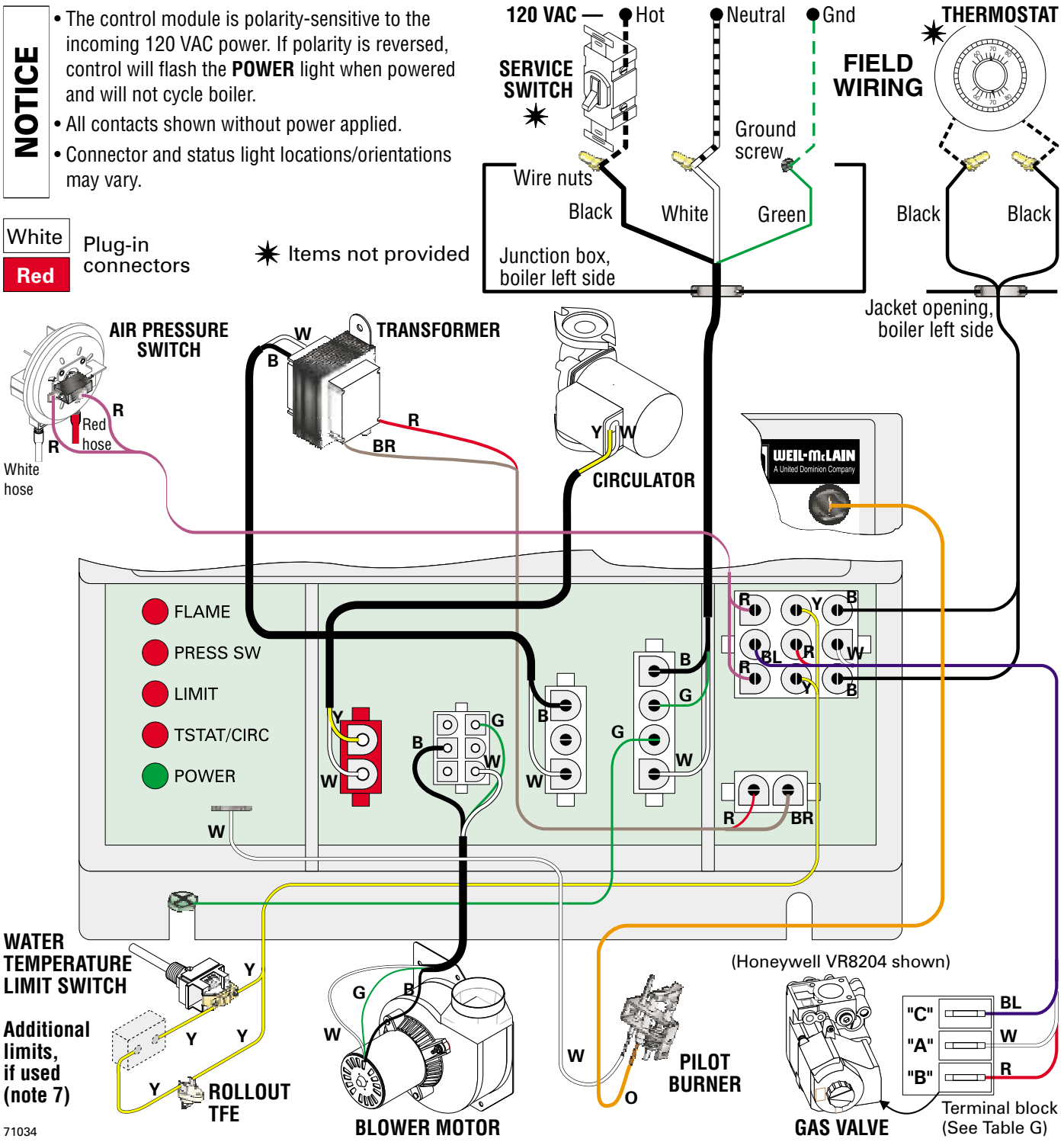


Figure 32 Ladder wiring diagram

WARNING Electrical shock hazard — can cause severe injury or death. Disconnect power before installing or servicing.

NOTICE All contacts are shown without power applied.

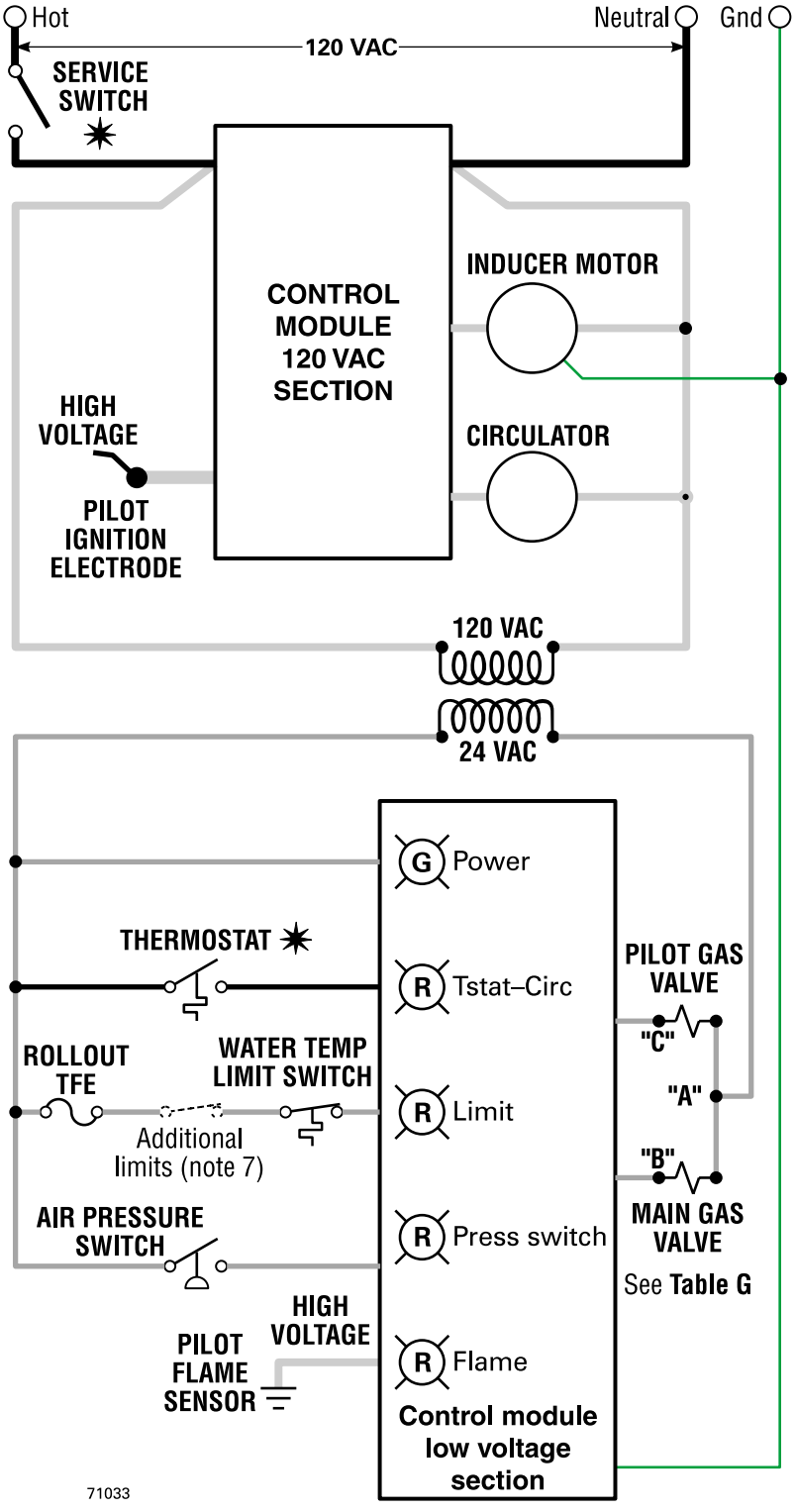
Legend for ladder wiring diagram

- 120 VAC field wiring
- Low voltage field wiring
- 120 VAC factory wiring
- Low voltage factory wiring
- High voltage spark ignition wiring
- Ground connectors

Table G: Gas valve terminals and anticipator settings

Gas valve	"A"	"B"	"C"	Anticipator amps
Honeywell VR8204	MV/PV	MV	PV	0.6
Honeywell VR8304	MV/PV	MV	PV	0.8
White-Rodgers 36E	2	1	3	0.64
White-Rodgers 36C	2–4 *	1	3	0.7
* Terminals 2–4 are factory-jumpered on the White-Rodgers 36C gas valve.				

1. All wiring must be installed in accordance with:
   A. U.S.A. — N.E.C. And any other national, state, or local code requirements.
   B. Canada — C.S.A. C22.1 C.E.C. Part 1 and any other national, provincial, or local code requirements.
2. Pilot lead wires are not field replaceable. Replace pilot assembly if necessary.
3. If any of the original wire as supplied with the appliance must be replaced, use minimum 105 °C wire or equivalent. Exception — wires to a rollout TFE must be 200 °C or equivalent.
4. Thermostat anticipator setting (single zone) — see Table G for anticipator setting, depending on which gas valve is installed in boiler.
5. For multiple zoning, use either zone valves or circulators. Refer to the component manufacturer's instructions and this manual for application and wiring suggestions.
6. Refer to control component instructions packed with the boiler for application information.
7. Wire any additional limit controls (low water cut-off, additional high limit, etc.) in series with boiler limit control as shown.



9c Operation — operating instructions

Figure 33 Operating instructions

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. **Do not** try to light the pilot by hand.

B. Before **OPERATING**, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

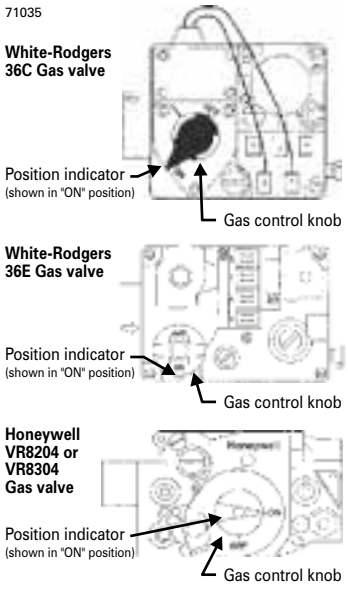
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

OPERATING INSTRUCTIONS

1. **Stop!** Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electrical power to the appliance.
4. Remove jacket front panel.
5. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
6. Turn **Gas control knob** clockwise ↷ to **OFF**.
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, **STOP!** Follow **"B"** in the safety information above. If you don't smell gas, go to the next step.
8. Turn **Gas control knob** counterclockwise ↶ to **ON**.
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions **"To Turn Off Gas To Appliance"** below and call your service technician or gas supplier.
12. Replace jacket front panel.


71035
White-Rodgers 36C Gas valve
Position indicator (shown in "ON" position)
Gas control knob
White-Rodgers 36E Gas valve
Position indicator (shown in "ON" position)
Gas control knob
Honeywell VR8204 or VR8304 Gas valve
Position indicator (shown in "ON" position)
Gas control knob

TO TURN OFF GAS TO THE APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove jacket front panel.
4. Turn **Gas control knob** clockwise ↷ to **OFF**. Do not force.
5. Replace jacket front panel.

10a Service and maintenance — schedule

Table 8 Service and maintenance schedules

Service technician (see following pages for instructions)		Owner maintenance (see CGi User's Information Manual for instructions)	
ANNUAL START-UP	**Inspect:** • Reported problems • Boiler area • Air openings • Flue gas vent system • Pilot and main burner flames • Water piping • Boiler heating surfaces • Burners and burner shield • Condensate drain system **Service:** • Inducer motor • Oiled-bearing circulators **Start-up:** • Perform start-up per manual **Check/test:** • Gas piping • Cold fill and operating pressures • Air vents and air elimination • Limit controls and cutoffs • Expansion tank • Boiler relief valve **Review:** • Review with owner	**Daily**	• Check boiler area • Check air openings • Check boiler pressure/ temperature gauge
		Monthly	• Check boiler interior piping • Check venting system • Check air vents • Check boiler relief valve • Check condensate drain system • Check automatic air vents (if used)
		Periodically	• Test low water cutoff (if used)
		Every 6 months	• Oil inducer motor • Operate relief valve
		End of season	• Shut down procedure

WARNING

Follow the **Service and maintenance** procedures given throughout this manual and in component literature shipped with the boiler. Failure to perform the service and maintenance could result in damage to the boiler or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death or substantial property damage.

10b Service and maintenance —annual start-up

WARNING

The boiler should be **inspected and started annually**, at the beginning of the heating season, **only by a qualified service technician**. In addition, the maintenance and care of the boiler designated in **Table 8** and explained on the following pages must be performed to assure maximum boiler efficiency and reliability. Failure to service and maintain the boiler and system could result in equipment failure.

❑ Inspect . . . . . .

Reported problems

Inspect any problems reported by owner and correct before proceeding.

Boiler area

1. Verify that boiler area is free of any **combustible materials**, gasoline and other flammable vapors and liquids.
2. Verify that boiler area (and air intake) is free of any of the **contaminants** listed in **Table 1** on page 9 of this manual. If any of these are present in the boiler intake air vicinity, they must be removed. If they cannot be removed, isolate the boiler and provide outside combustion air. See national, provincial or local codes for further information.

Air openings

1. Verify that combustion and ventilation air openings to the boiler room and/or building are open and **unobstructed**.
2. Verify that boiler vent discharge is **clean and free of obstructions**.

Flue gas vent system

1. **Visually inspect entire flue gas venting system** for blockage, deterioration or leakage. Repair any joints that show signs of leakage in accordance with vent manufacturer's instructions. When air is ducted to boiler, verify that air inlet hose is connected and properly sealed.

WARNING

Failure to inspect for the above conditions and have them repaired can result in severe personal injury or death.

Pilot and main burner flames

1. Visually inspect pilot burner and main burner flames as directed under **Start-up**, section **7** of this manual.

Water piping

1. Check the boiler interior piping and all system piping for signs of leaks.
2. Repair any leaks before proceeding.

WARNING

Eliminate all system or boiler leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure. Leaking water may also cause severe property damage.

DANGER

Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

WARNING

Electrical shock hazard — **Turn off power to the boiler before any service operation** on the boiler except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

Boiler heating surfaces

1. Disconnect the vent pipe at the boiler inducer outlet connection after turning off power to the boiler.
2. Use a bright light to inspect the flue pipe interior and inducer interior.
3. Inspect the boiler vent outlet area and heating surfaces by looking through the opening.
4. If the vent pipe or inducer interior show evidence of soot, follow **Cleaning boiler heating surfaces** in this manual section to remove the flue collector and clean the boiler if necessary after close inspection of boiler heating surfaces. If there is evidence of rusty scale deposits, check the water piping and control system to make sure the boiler return water temperature is properly maintained (per this manual).
5. Reconnect vent to inducer outlet and replace all boiler components before returning to service.
6. Check inside and around boiler for evidence of any leaks from the boiler. If found, locate source of leaks and repair.

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 64** of this manual. Failure to comply could result in severe personal injury.

❑ Inspect . . . . . .

Burners and base

WARNING

If insulation is damaged or displaced, do not operate the boiler. Replace or reposition insulation as necessary. Failure to replace damaged insulation can result in a fire hazard, causing severe personal injury, death or substantial property damage.

1. After turning off power to the boiler, remove the base burner shield (**Figure 40**, item **4**, page 58).
2. Inspect burners and all other components in the boiler base.
3. If burners must be cleaned, access the burner assembly removing the screws securing the burner tray to the manifold. Slide the burner tray out. Then brush and vacuum the burners thoroughly, making sure all ports are free of debris.
4. Inspect the slotted jacket cooling openings in the bottom left and right of the base pan (**Figure 40**, item **7**, page 58).
5. Inspect the base insulation. Pay attention to the **WARNING** on page 64 regarding working with insulation materials. Verify that the insulation is intact and secure against all four sides of the base.

Condensate drain system

1. Inspect condensate drain fittings and tubing. Verify that condensate can flow freely to drain.

❑ Service annually. . . . . .

Inducer motor

1. With boiler power **off**, place a few drops of S.A.E. 20 motor oil in each of the two oil cups.

WARNING

Use only **S.A.E. 20 motor oil** to lubricate the inducer motor. Do not use universal household oils. Motor could be damaged, resulting in possible severe property damage.

Oiled-bearing circulators

1. The circulator shipped with the CGi boiler is water-lubricated. No oiling is required.
2. Check other circulators in the system. Oil any circulators requiring oil, following circulator manufacturer's instructions. Over-oiling will damage the circulator.

❑ Start-up . . . . . .

1. Perform start-up procedures in section **7**, pages 32-35 of this manual.
2. Verify **cold fill pressure** is correct and that fill system is working properly.
3. Verify **antifreeze level** (if used) is at the right concentration and that inhibitor level is correct.
4. **Check gas piping**, per manual section **5**, page 30 and section **7a**, page 32, verifying no indications of leakage and all piping and connections are in good condition.
5. Read the **Operating instructions** (**Figure 33**, page 40 of this manual or on boiler label) applying to the boiler.
6. Start the boiler following the **Operating instructions**, page 40 of this manual.

10b Service and maintenance —annual start-up (continued)

❑ Check/test . . . . . .

Gas piping

1. Sniff near floor and around boiler area for any indication of a **gas leak**.
2. **Test gas piping using bubble test**, per section **5** of this manual, if there is any indication of a leak.

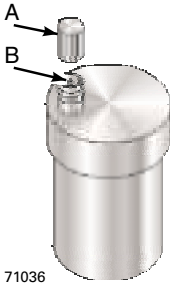
Cold fill and operating pressures

1. While the system is cold, note the **pressure reading** on the boiler pressure/temperature gauge. Verify that cold fill pressure is correct.
2. **Watch the pressure** as the boiler and system heat up to ensure pressure rise is normal. Too high a rise would indicate a waterlogged or undersized expansion tank.

Air vents and air elimination

1. Inspect automatic air vents (if used). Also inspect air separators to ensure they are operational.
2. The cap must be unscrewed one turn to allow air to escape.
3. See **Figure 34**. If the air vent is leaking, remove cap **A** and briefly push valve **B** and then release to clean the valve seat.
4. Replace cap **A** by twisting all the way onto valve **B** and then unscrewing one turn.

Figure 34 Automatic air vent, typical



Limit controls and cutoffs

1. Inspect and test the boiler limit control. Verify operation by turning control set point below boiler temperature. Boiler should cycle off. Return dial to original setting.
2. Inspect and test additional limit controls or low water cutoffs installed on system.

Expansion tank

1. Expansion tanks provide space for water to move in and out as the heating system water expands due to temperature increase or contracts as the water cools. Tanks may be open, closed or diaphragm or bladder type. See section **3**, pages 14-19 of this manual, for suggested best location of expansion tanks and air eliminators.

   Open-type — located above highest radiator or baseboard unit, usually in the attic or closet. Has a gauge glass and overflow pipe to a drain.

   Closed-type — welded gas tight and located above boiler. Tank is partially filled with water, leaving an air cushion for expansion.

   - Make sure this type of tank is fitted with a **tank fitting**, such as the B & G *Tank-Trol* or Taco *Taco-Trol*. This fitting reduces gravity circulation of air-saturated tank water back to the system and prevents the air from bubbling up through the water as it returns from the system.
   - **Do not use automatic air vents in systems with closed-type tanks**. The air will escape from the system instead of returning to the tank. Eventually, the tank will waterlog and no longer control pressurization. The boiler relief valve will weep frequently.

   Diaphragm- or bladder-type — welded gas tight with a rubber membrane to separate the tank pressurizing air and the water. May be located at any point in the system, but most often found near the boiler.

   - Systems with this type of expansion tank require at least one **automatic air vent**, preferably located on top of an air eliminator, as shown in examples in manual section **3**, pages 14-19.

2. If relief valve has tended to weep frequently, the expansion tank may be waterlogged or undersized.

   Closed-type tank — tank is most likely waterlogged. Install a tank fitting if not already installed. Then check fill level per fitting manufacturer's instructions. If fill level is correct, check tank size against manufacturer's instructions. Replace with a larger tank if necessary.

   Diaphragm- or bladder-type — first, check tank size to be sure it is large enough for the system. If size is too small, add additional tank(s) as necessary to provide sufficient expansion. If tank size is large enough, remove tank from system and check charge pressure (usually 12 psig for residential applications). If tank won't hold pressure, membrane has been damaged. Replace tank.

❑ Check/test . . . . . .

Boiler relief valve

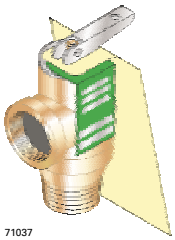
WARNING

Safety relief valves should be **reinspected AT LEAST ONCE EVERY THREE YEARS**, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency — not by the owner. Failure to reinspect the boiler relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death or substantial property damage.

WARNING

Following installation, the **valve lever must be operated AT LEAST ONCE A YEAR** to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal otherwise severe personal injury may result. **If no water flows, valve is inoperative.** Shut down boiler until a new relief valve has been installed.

Figure 35
Relief valve, typical



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1. Inspect the relief valve and lift the lever to verify flow as in the following warnings, excerpted from a relief valve manufacturer's warning label. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read manual section **3a**, page 14, before proceeding further.

2. After following the above warning directions, if the relief valve weeps or will not seat properly, replace the relief valve. Ensure that the reason for relief valve weeping is the valve and not over-pressurization of the system due to expansion tank waterlogging or undersizing.

❑ Review with owner

1. Review the **User's Information Manual** with the owner.
2. Emphasize the need to perform the maintenance schedule specified in the **User's Information Manual** (and in this manual as well).
3. Remind the owner of the need to call in a licensed contractor should the boiler or system exhibit any unusual behavior.
4. Remind the owner to follow the proper shutdown procedure and to schedule an annual start-up at the beginning of the next heating season.

❑ Cleaning boiler heating surfaces

1. Shut down boiler:
   - Follow "**To Turn Off Gas to Appliance**" instructions on boiler and **Operating instructions**.
   - Do not drain boiler unless it will be exposed to freezing temperatures. If using antifreeze in system, do not drain.
2. Follow shutdown procedure.
3. Remove venting system connection to boiler.
4. Remove top jacket panel. Turn back insulation.
5. Remove collector box/transition assembly. Clean sealant from assembly and sections.
6. Remove radiation plates hanging between sections.
7. Remove burners from base. Brush and vacuum burners to remove all dust and lint. Verify that all burner ports are free of debris.
8. Place newspapers in base of boiler to collect soot.
9. Clean between sections with wire flue brush.
10. Remove newspaper and soot. Vacuum or brush base and surrounding area.
11. Reinstall radiation plates.
12. Replace collector box/transition assembly. Seal with sealant. Obtain gas-tight seal to prevent flue gas spillage and carbon monoxide emissions, resulting in severe personal injury or death.
13. Replace insulation and jacket top panel.
14. Start up boiler following section **7**, pages 32-35 of this manual and the boiler **Operating instructions**. Excessive sooting indicates improper gas combustion. If found check for proper combustion and make any necessary adjustments.

WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 64** of this manual. Failure to comply could result in severe personal injury.

11a Troubleshooting — procedure

WARNING

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

WARNING

Never jumper (bypass) rollout thermal fuse element or any other device except for momentary testing as outlined in **Troubleshooting Charts**. Severe personal injury, death or substantial property damage can result.

Before troubleshooting:

1. Have the following items:
   a. Voltmeter that can check 120 VAC and 24 VAC.
   b. Microammeter with a minimum scale range of 0-25.
   c. Continuity checker.
   d. Inclined manometer with 0 – 2.5" w.c. range.
2. Check for 120 VAC (minimum 102 VAC to maximum 132 VAC) to boiler.
3. Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for 24 VAC between thermostat wire nuts and ground.

Check the following:

1. Wire connectors to control module are securely plugged in at module and originating control.
2. Air pressure switch hoses are properly and securely plugged in and are not damaged.
3. Gas pressures:
   a. With boiler off — 13" w.c. maximum natural or propane gas pressure upstream of gas valve.
   b. With boiler on:
      - 5" w.c. minimum natural gas pressure or 11" w.c. propane gas pressure upstream of gas valve.
      - 3 ½" w.c. minimum natural gas pressure or 10" w.c. propane gas pressure downstream tapping on gas valve — Can be adjusted by regulator on gas valve.

11b Troubleshooting — components

Air pressure switch

NOTICE

Make sure boiler water temperature is 100 °F or cooler before starting procedure to obtain appropriate readings.

Check pressure switch setting

1. See **Figure 36**, page 47 and **Table 9**.
2. Remove both air pressure switch hoses from air pressure switch.
3. Install tees and tubing as shown in **Figure 36**, page 47 to inclined manometer.
4. Turn off gas valve and set thermostat to call for heat. Inducer will run but burners will not ignite.
5. Check for 24 VAC between both air pressure switch terminals.
6. If manometer reading is above the setpoint of the switch (see **Table 9**), but there is not 24 VAC between both air pressure switch terminals — replace air pressure switch.

Troubleshooting air pressure reading

1. If manometer reading is lower than the setpoint of the switch (see **Table 9**) — check for possible causes:
   - blockage in hoses
   - obstruction in inducer housing outlet
   - loose inducer wheel on motor shaft
   - inducer motor not in proper rpm
   - inducer back plate not sealed properly
   - blockage in block assembly
   - blockage in flue pipe or termination
   - incorrect pressure switch

Return to normal operation

When pressure reading is correct and air pressure switch is operating properly — remove tees and reinstall hoses to air pressure switch.

NOTICE

The boiler will not operate correctly unless pressure switch hoses are correctly located. The red hose connects from the right side (negative) hose barb to the flue collector. The white hose connects from the left side (positive) hose barb of the switch to the connector box (between flue collector and inducer) as shown in **Figure 36**, page 47.

Table 9
Pressure switch setpoint (for elevations above 2,000 ft, contact your local Weil-McLain sales office for details.)

Boiler model number	Inches W.C.
CGi-25 and CGi-3	1.79
CGi-4	1.40
CGi-5	1.12
CGi-6 and CGi-8	0.80
CGi-7	0.75

11b Troubleshooting — components (continued)

Control module

WARNING

Solder or water splatter between plugs and circuit board can cause improper operation of control module. Place a shield over the boiler internal controls and components during installation. Failure to comply could result in severe personal injury, death or substantial property damage.

NOTICE

Make sure **ground wiring** is installed per wiring diagram. Good grounding is extremely important for proper operation.

Control indicator lights — lockout modes

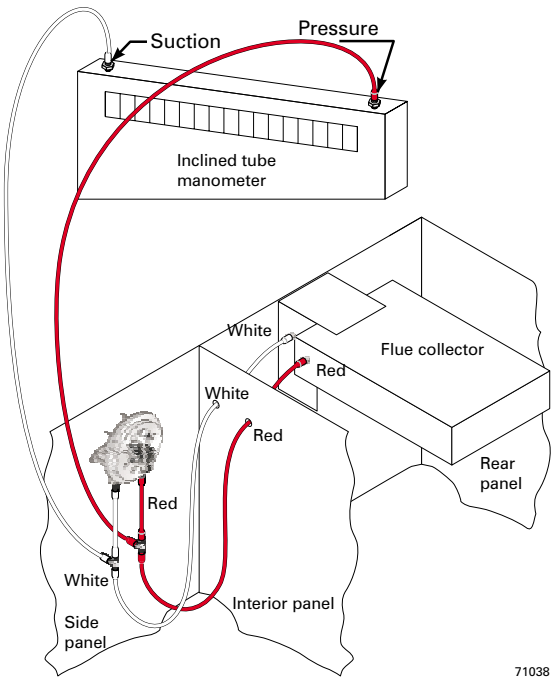
See **Charts 1** through **7** in this section for detailed troubleshooting procedures.

To reset control after a lockout, turn off power at the 120 VAC service switch or turn down all thermostats. Wait 45 seconds. Then restore power or call for heat.

POWER light flashing alone

Usually indicates reversed polarity of 120 VAC power wires.

Figure 36 Manometer connections



POWER and TSTAT CIRC lights flashing

Usually indicates stray voltage on external thermostat circuit wires (usually due to miswired 3-wire zone valve).

POWER and PRESS SWITCH lights flashing

Usually indicates pressure switch is closed when it should not be, or pressure switch failed to close within 5 minutes of inducer starting.

POWER and FLAME lights flashing

Usually indicates false flame sense or flame sensed when it shouldn't be there.

Control indicator lights — non-lockout modes

FLAME light flashing alone

Usually indicates pilot flame was not established within 15 seconds from application of spark. Control will flash light, but will continue to cycle indefinitely until flame is established or problem is corrected.

PRESS SWITCH light flashing alone

Usually indicates pressure switch opened during the run cycle.

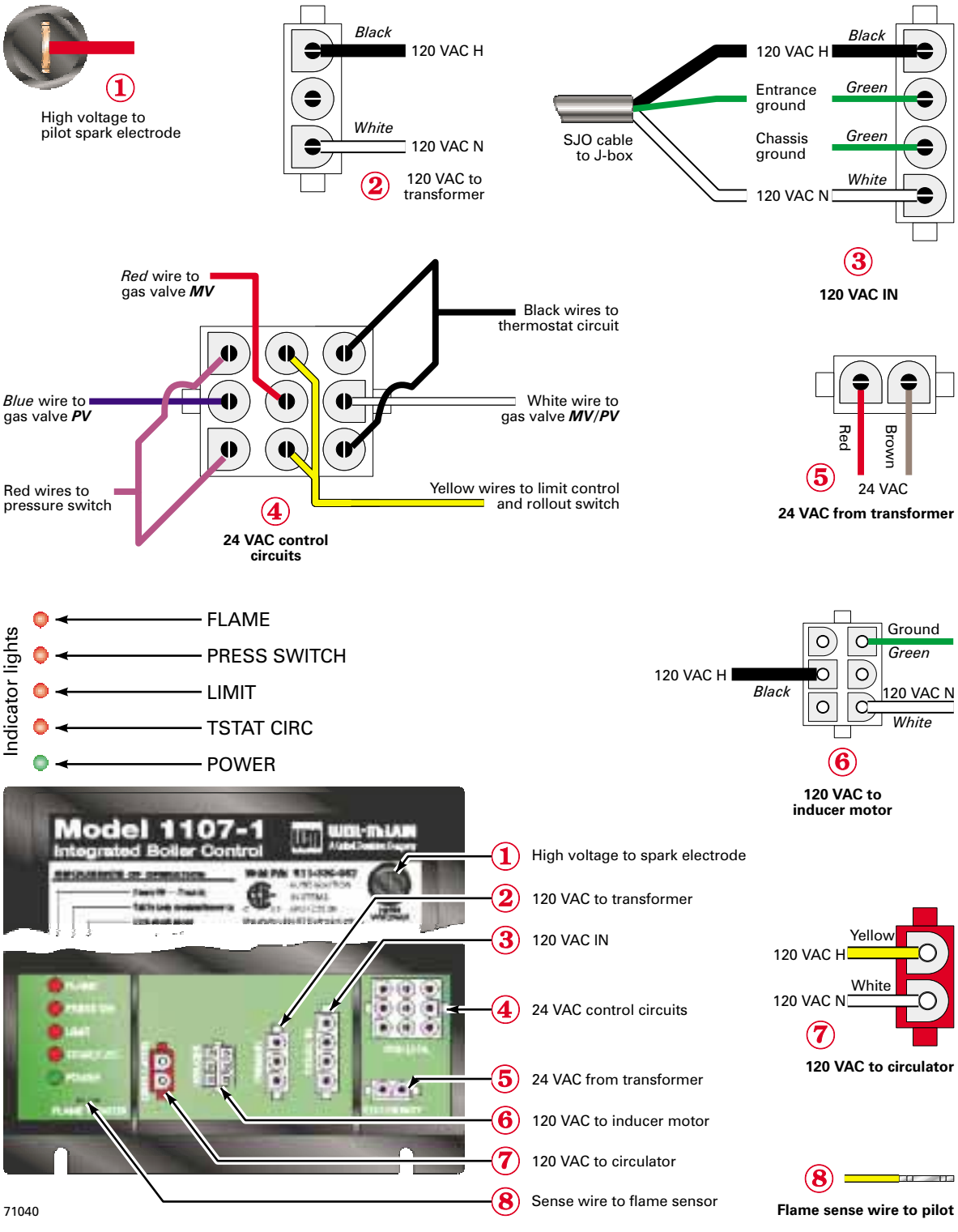
Troubleshooting the control module

See **Figure 38** for location of harness plug receptacles and plugs on the control module.

Figure 37 Control module

11b Troubleshooting — components continued

Figure 38 Control module connections



11c Troubleshooting — control module lights

CHART 1 — Troubleshooting POWER light status

— Usually indicates reversed 120 VAC polarity if POWER light flashes by itself —

WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

*Is **POWER** light off?*

No | Yes

- Make sure service switch or circuit breaker is on or fuses are good.
- Remove **120 VAC IN** plug (**Figure 38, Item 3**, page 48) on control module.
- Using voltmeter, check across top and bottom pins of **120 VAC IN** plug.

*Does voltmeter indicate **120 VAC**?*

No | Yes

Problem is with incoming electricity. Have licensed electrician repair circuit.

- Reconnect **120 VAC IN** plug.
- Remove **120 VAC IN** transformer **PRIMARY** plug (**Figure 38, Item 2**, page 48) on control module.
- Using voltmeter, check across top and bottom pins of **PRIMARY** receptacle.

*Does voltmeter indicate **120 VAC**?*

No | Yes

Replace control module. Retest.

- Reinstall **120 VAC** transformer **PRIMARY** plug.
- Remove **24 VAC** transformer plug (**Figure 38, Item 5**, page 48) on control module.
- Using voltmeter, check pins of plug.

*Does voltmeter indicate **24 VAC**?*

No | Yes

Replace transformer. Retest and check for back feed of voltage from system wiring.

Replace control module. Retest.

*Is **POWER** light ...*

Flashing alone	Flashing with another light	On steady (not flashing)
TSTAT CIRC light flashing	**Chart 2**	
PRESS SWITCH light flashing	**Chart 3**	**Chart 5**
FLAME light flashing	**Chart 4**	**Chart 6**

For insufficient heat or no heat problem, go to **Chart 7** if **POWER** light is on steady, with no other light flashing.

- Usually indicates polarity on incoming **120 VAC** power line is wrong.
- **▲TURN OFF POWER▲** at service switch or breaker, then reverse the HOT and NEUTRAL wires entering the boiler in the J-box.
- Restore **POWER** at service switch or breaker.

*Is **POWER** light flashing now?*

No | Yes

Boiler should now operate normally.

Have system checked by a licensed electrician. If problem persists, call your local Weil-McLain sales representative.

11c Troubleshooting — control module lights

CHART 2 — TSTAT CIRC & POWER lights flashing

— Usually indicates 48 VAC on thermostat circuit (stray voltage) —

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Disconnect the two external wires connected to the boiler thermostat leads (two black low voltage leads in J-box).
- Connect a voltmeter across these two incoming wires. Close each thermostat, zone valve and relay in the external circuit one at a time and check the voltmeter reading across the wires.
- There should NEVER be a voltage reading.
- If a voltage does occur under any condition, check and correct the external wiring. (This is a common problem when using 3-wire zone valves.)
- Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires to the boiler thermostat wires and allow the boiler to cycle.

Did you find a voltage across the two external thermostat circuit wires?

Yes

- Leave external boiler thermostat connection wires disconnected from boiler.
- Troubleshoot the external thermostat circuit until you find the source of the stray voltage. (Pay close attention to the wiring connections to 3-wire zone valves.)
- Correct the problem and repeat the voltmeter test above, verifying there is no longer a voltage reading under any condition in the external thermostat circuit.
- An isolating relay may be required.

- Boiler should now operate per the normal sequence of operation shown in **Figure 30**, page 37.

No

- If no voltage is found under any condition of the external thermostat circuit, connect the two boiler thermostat connection leads together (or jumper the boiler aquastat T-T terminals).
- Turn off power to the boiler for 1 minute.
- Turn on power and allow boiler to cycle.

Do the **TSTAT** *and* **POWER** *lights still flash?*

No

Yes

- Replace control module.
- Retest.

continued

CHART 3 — PRESS SWITCH & POWER lights flashing

— Usually indicates pressure switch stuck closed or failed to make within 5 minutes —

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Reset boiler control by turning off power at service switch or turning down thermostat for at least 45 seconds.
- Thermostat should call for heat and appropriate zone valves open.

Does inducer motor operate?

No

- Wait 45 seconds.

Does inducer motor operate?

No

- Remove **INDUCER** plug (***Figure 38, Item 6***, *page 48*) from plug receptacle of control module.
- Place voltmeter leads across the **120 VAC N** and **120 VAC H** pins of the **INDUCER** receptacle (left column center and right column bottom pins).

*Does the voltmeter indicate **120 VAC**?*

No

- Remove one of the wires connected to the pressure switch.
- Check continuity across the switch terminals.

Does the ohmmeter indicate the switch is closed?

No

- Replace control module.
- Retest.

Yes

- Check air pressure switch per manual Section 11.
- Replace if necessary.
- Retest.

Yes

- Try reseating plug in module receptacle and restart.
- If inducer still does not work, replace inducer assembly.
- Retest.

Yes

- Wait 5 minutes.

*Is **PRESS SWITCH** light flashing?*

No

- Boiler should be in normal operating sequence.
- Observe operation until thermostat is satisfied and inducer has completed its post-purge cycle.

Yes

Are vent or combustion air passages blocked?

No

- Clear passages and recycle boiler.
- Recheck boiler operation.

Yes

11c Troubleshooting — control module lights

CHART 4 — FLAME & POWER lights flashing

— Usually indicates flame sensed when it shouldn't be there —

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

Are manual main shutoff valve and gas valve open?

No

- Leave main manual gas valve closed.
- Turn off power to boiler at service switch or breaker.
- Wait at least 45 seconds.
- Turn on power to boiler.
- Restart boiler, following **Operating instructions** in this manual (**Figure 33**, page 40).

*Do **FLAME** and **POWER** lights still flash?*

No

- **▲TURN OFF POWER▲** to boiler at service switch or breaker.
- Open main manual gas valve.
- Turn on power to boiler at service switch or breaker.
- Restart boiler per lighting instructions.
- Perform start-up procedures in boiler manual to verify proper operation.

Yes

- Replace control module.
- Retest.

Yes

- Turn off power to the boiler at service switch or breaker.
- Wait at least 45 seconds.
- Turn on power to boiler.
- Restart boiler, following **Operating instructions** in this manual (**Figure 33**, page 40).
- Look through the pilot inspection port to see if the pilot is burning during the prepurge period (first 30 seconds of operation).

Is pilot burning during prepurge period?

No

- Allow boiler to continue cycling.

*Are **FLAME** & **POWER** lights flashing?*

No

- Boiler may now be operating normally.
- Perform start-up procedures in boiler manual to verify proper operation.

Yes

- Replace control module.
- Retest.

Yes

- Replace gas valve.
- Retest boiler.

*Are **FLAME** and **POWER** lights flashing?*

No

- Boiler should now operate normally.
- Original flashing FLAME light caused by gas valve not operating properly.
- See normal sequence of operation, **Figure 30**, page 37.

Yes

- Replace control module.
- Retest.

continued

CHART 5 — PRESS SWITCH light flashing and POWER light on steady

— Usually indicates pressure switch opened during run cycle —
— May also be caused by wind gusts in excess of 31 mph for non-direct vent sidewall-vented boilers —

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Reset boiler control by turning off power at service switch or turning down thermostat for at least 45 seconds.
- Thermostat should call for heat and appropriate zone valves open.

Does blower motor operate?

No

- Remove **INDUCER** plug (***Figure 38, Item 6***, *page 48*) from plug receptacle of control module.
- Place voltmeter leads across the **120 VAC N** and **120 VAC H** pins of the **INDUCER** receptacle (left column center and right column bottom pins).

*Does the voltmeter indicate **120 VAC**?*

No

- Remove one of the wires connected to the pressure switch.
- Check continuity across the switch terminals.

Does the ohmmeter indicate the switch is closed?

No

- Inspect and check wire harness from control module to pressure switch.
- Reseat connector in control module receptacle.
- If harness is intact and properly seated, but problem persists, replace control module.
- Retest.

Yes

- Replace inducer assembly.
- Retest.

Yes

- Check air pressure switch per manual Section 11b.
- Replace if necessary. Retest.

Yes

- Wait 5 minutes.

*Is **PRESS SWITCH** light flashing?*

No

- Boiler should be in normal operating sequence.
- Observe operation until thermostat is satisfied and inducer has completed its post-purge cycle.

Yes

Is vent blocked?

No

- Check air pressure switch per manual Section 11b.
- Replace if necessary. Retest.

Yes

- Clear vent and recycle boiler.
- Recheck boiler operation.

11c Troubleshooting — control module lights (continued)

CHART 6 — FLAME light flashing and POWER light on steady

ALSO — Troubleshooting failure to establish main flame

WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Are main manual shutoff valve and boiler gas valve open?

No

- ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Open main manual shutoff valve and boiler gas valve (per **Operating instructions** in this manual). Wait at least 45 seconds.
- Turn on power at service switch or breaker. Allow boiler to cycle.

Does **FLAME** *light flash now?*

No

- Boiler should be in normal operating sequence.
- Observe operation until thermostat is satisfied and blower has completed its post-purge cycle.

Yes

- Verify inlet gas pressure at gas valve:

Natural gas — 5.0" w.c. min/14.0" w.c. max

Propane — 11.0" w.c. min/14.0" w.c. max

Is gas present at gas valve inlet and within above range?

Yes

- ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Remove burner shield (see **Figure 40**, page 58 for location).
- Verify pilot gas line is not kinked, obstructed or damaged and is correctly attached to pilot and gas valve.
- Verify pilot ignition electrode, electrode ceramic and spark lead wire from control are in good condition. Spark gap should be approximately 1/8".
- Correct any above problems, replacing pilot if burner or wiring is damaged.
- Reinstall burner shield to operate boiler for retest after any changes or corrections.
- If none of the above corrects problem, then replace the control module and retest.

No

- Contact gas supplier to correct pressure or gas supply.

- Is pilot flame visible through inspection port?

No

- Check the voltage across terminals PV and PV/MV of the gas valve.

Is ***24 VAC*** *present there?*

Yes

- If the wiring from the control module to gas valve is intact, replace the control module.
- Retest.

No

- ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Remove burner shield (see **Figure 40**, page 58 for location).
- Verify pilot burner is securely attached to pilot bracket, bracket is securely attached to cross tie, and there is no corrosion on the parts which would affect the ground path for flame sense.
- Verify that pilot flame rod, flame rod ceramic and lead wire from control module to flame rod are in good condition.
- Correct any above problems, replacing pilot if burner or wiring is damaged.

Yes

- Make sure ground wire terminal is securely fastened to control module mounting screw.
- Check the voltage across terminals MV and PV/MV of the gas valve.

Is ***24 VAC*** *present there?*

No

- If the wiring from the control module to gas valve is intact, replace the control module.
- Retest.

Yes

- Verify inlet gas pressure at gas valve:

Natural gas — 5.0" w.c. min/14.0" w.c. max

Propane — 11.0" w.c. min/14.0" w.c. max

Is gas present at gas valve inlet and within above range?

No

- Contact gas supplier to correct pressure or gas supply.

Yes

- ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Check flame signal — Detach sense lead from ignition control (***Figure 38, item 8***, *page 48*).
- Connect **negative** lead of MICROAMMETER to control sense terminal (***Figure 38, item 8***, *page 48*). Connect positive lead of MICROAMMETER to sense wire.
- DISCONNECT **red** wire connected to terminal **MV** of the gas valve.
- Turn on power to boiler and allow to cycle. As soon as pilot is burning, the MICROAMMETER should read at least 1.0 microamp.

Is flame signal at least 1.0 microamp?

No

- If none of the previous steps (including replacing pilot) corrects problem, then replace the control module, reinstall burner shield and retest.

Yes

- If the wiring from the control module to gas valve is intact, replace the control module and retest.

CHART 7 — Insufficient heat or no heat to system (POWER light on steady)

WARNING Electrical shock hazard — Wherever you see **▲TURN OFF POWER▲**, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Has it been at least 5 minutes since setting thermostat to call for heat? If not, wait 5 minutes. Is system heating?
- Is thermostat set to call for heat? Remove thermostat wires at boiler and check continuity across the two wires. If circuit isn't closed, check external thermostat (zone valve, relay, etc.) wiring. Correct problems and retry.
- Reconnect external thermostat wiring at boiler.

Is thermostat circuit closed (continuity across wires)?

No → Are all red lights off?

Are all red lights off?

No → Wait 30 seconds. Are all red lights off?

Wait 30 seconds. Are all red lights off?

No → Replace control module. Retest.

Yes → Wait 30 seconds. Are all red lights off?

Yes → Wait 30 seconds. Are all red lights off?

Yes →

- Boiler is in standby.
- Set thermostat to call for heat and recheck operation.
- Verify **Sequence of operation, Figure 30,** page 37.

Yes → *Is boiler System circulator operating?*

Is boiler System circulator operating?

No →

- Remove CIRCULATOR harness plug from CIRCULATOR plug receptacle (***Figure 38, Item 7**, page 48*). Check with voltmeter across pins of control module receptacle.

Does voltmeter show 120 VAC across pins?

No →

- Replace control module.
- Retest.

Yes →

- Repair/replace circulator. Retest.
- Repair/replace wiring. Retest.

Yes → *Is boiler System circulator operating?*

- Wait 5 minutes.

*Is **FLAME** light on?*

Yes →

- If you have sufficient heat — boiler should be in normal operating sequence. (See normal sequence of operation, **Figure 30**.)
- If you have less than sufficient heat —

Is vent piping free of blockage?

No →

- Correct conditions and recheck operation.
- See **Figure 30**, page 37 for normal sequence of operation.

Yes →

- Check heat loss calculation versus boiler size.
- Clock gas input.

No → *Is **LIMIT** light on?*

*Is **LIMIT** light on?*

No →

- Check limit switch contacts with continuity checker.

Are limit switch contacts closed?

No →

- Wait for boiler water to cool to temperature 20 to 30 ˚F lower than temperature set on limit switch.

Are limit switch contacts closed?

No →

- Replace limit switch.
- Retest.

Yes →

- Boiler water temperature exceeded setting on limit switch with thermostat calling for heat. Boiler is OK. (See normal sequence of operation, **Figure 30**, p. 37.)
- Also check setting on limit switch (should be above 140˚F.).

Yes →

- Replace control module.
- Retest.

Yes → *Check rollout switch continuity — is switch closed?*

Check rollout switch continuity — is switch closed?

No →

- Replace rollout switch.

DANGER

If rollout thermal fuse element has opened, determine cause and correct condition. Failure to do so will cause severe personal injury, death or substantial property damage.

Yes →

- Check any other limit controls wired into the limit circuit. If all are OK, then replace control module.
- Retest.

12a Replacement parts

Section assembly 57

Base assembly 58

Jacket assembly 59

Trim assembly 60

Gas control assembly 61

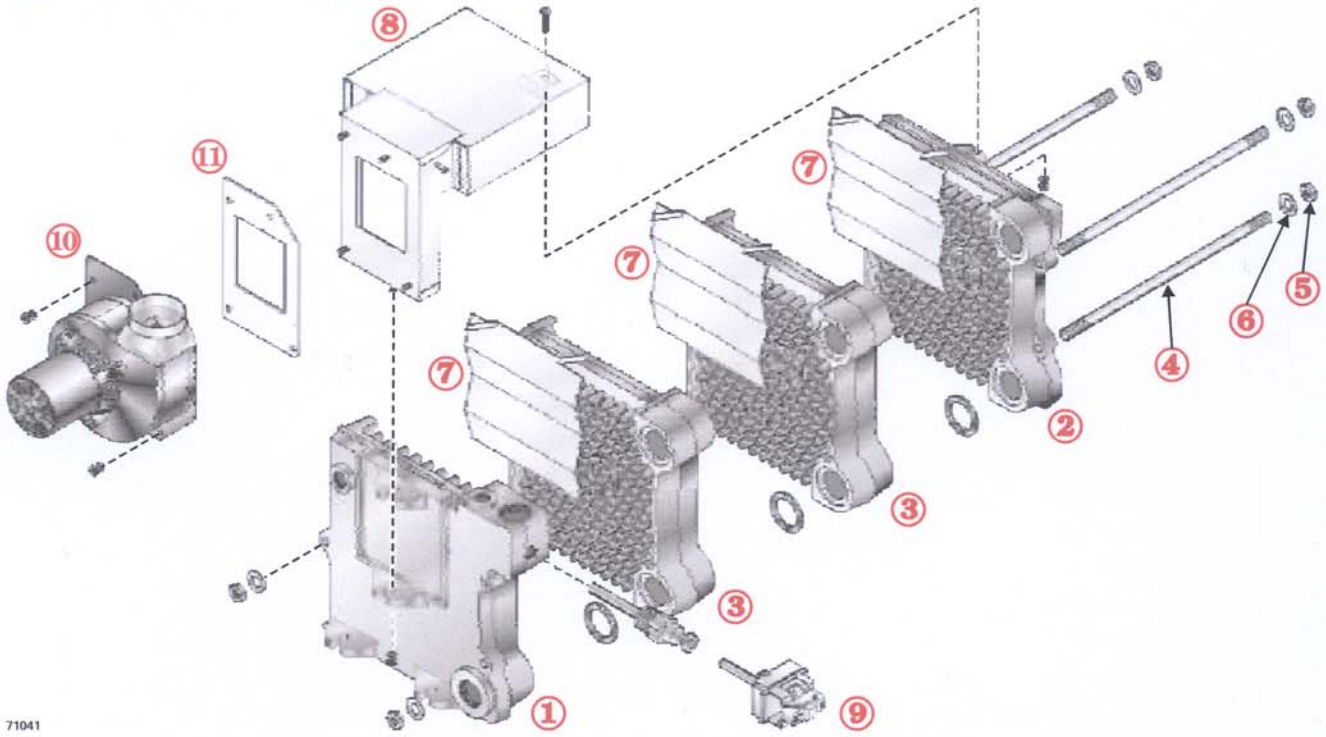
WARNING Replacement parts must be purchased through a local Weil-McLain distributor. When ordering, specify boiler model and size and include description and part number of replacement part. Results from using modified or other manufactured parts will not be covered by warranty and may damage boiler or impair operation.

NOTICE Weil-McLain part numbers are found in **Weil-McLain Boilers and Controls Repair Parts Lists**.

WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 64** of this manual. Failure to comply could result in severe personal injury.

12b Replacement parts — section assembly

Figure 39 Section assembly

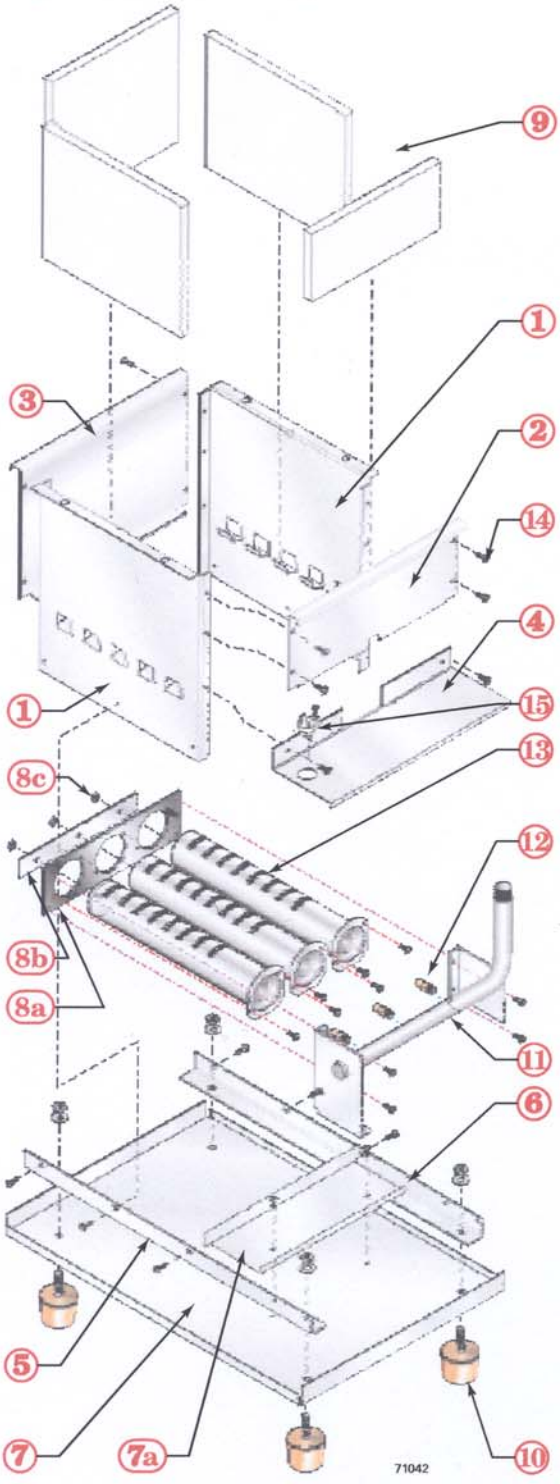


Item number	Description		Weil-McLain part number
1	End section, left hand, 51124		311-103-830
2	End section, right hand 51128		311-103-821
3	Intermediate section, 51125		311-103-818
not shown	Replacement section assembly	CGi-25 and CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	321-114-345 321-114-346 321-114-347 321-114-348 321-114-349 321-114-350
not shown	Section replacement kit, includes seals and sealant for 1 joint		381-354-527
4	Tie rod, 7/16" without nut (3 per boiler):	CGi-25 and CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	560-234-500 560-234-501 560-234-502 560-234-503 560-234-504 560-234-505
5	Nut, 7/16" (2 per tie rod)		561-928-235

Item number	Description		Weil-McLain part number
6	Washer, 7/16" (1 per tie rod)		562-248-684
7	Radiation plate (1 per joint)		460-003-700
8	Collector hood and transition assembly	CGi-25 CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	450-020-540 450-020-541 450-020-542 450-020-543 450-020-544 450-020-545 450-020-546
9	High limit, 30° differential, with well	Honeywell L4080D1036 White-Rodgers 11B81-3	510-312-250
10	Inducer fan assembly kit, includes inducer fan assembly, gasket and nuts		381-356-499
11	Gasket, inducer		590-317-627

12c Replacement parts — base

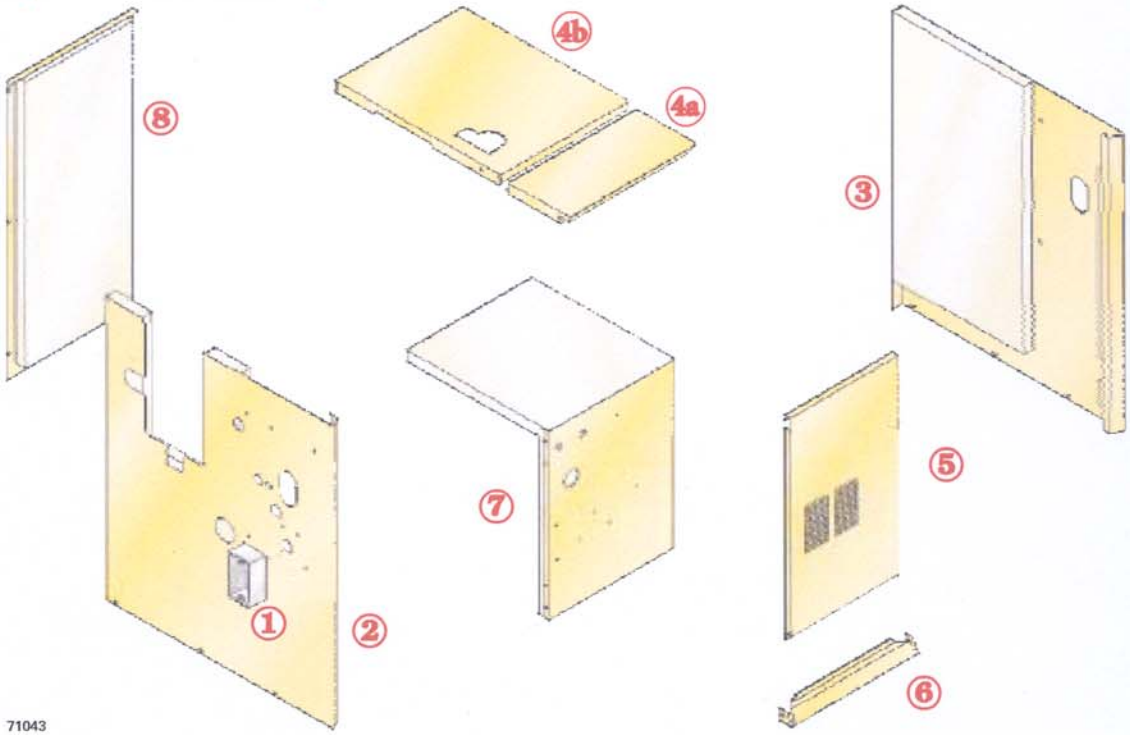
Figure 40 Base assembly



Item number	Description		Weil-McLain part number
	Base assembly kit (includes base panels items 1, 2, 3, 4, 5, 6 and 7)	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	381-354-337 381-354-338 381-354-339 381-354-340 381-354-341 381-354-342
1	Base side panel (in Base assembly)		
2	Base front cross-tie assembly (in Base assembly)		
3	Base back cross-tie assembly (in Base assembly)		
4	Burner shield (in Base assembly)		
5	Base pan angle, left side (in Base assembly)		
6	Base pan angle, right side (in Base assembly)		
7	Base pan (in Base assembly)		
7a	Base pan air baffle (in Base assembly)		
8a	Burner mounting plate	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	450-003-690 450-003-691 450-003-692 450-003-693 450-003-795 450-003-796
8b	Rear spacing strip	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	550-320-160 550-320-161 550-320-162 550-320-163 550-320-164 550-320-165
8c	Nut, hex 5mm Zp		550-320-170
9	Base insulation kit	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	381-354-330 381-354-331 381-354-332 381-354-333 381-354-334 381-354-335
10	Boiler leg kit		550-320-219
11	Manifold	CGi-25 & CGi-3 CGi-4 CGi-5 CGi-6 CGi-7 CGi-8	591-126-735 591-126-736 591-126-737 591-126-738 591-126-739 591-126-740
12	Main burner orifice — Natural gas, sea level (see Table 2, page 12) Main burner orifice — Propane gas, sea level (see Table 2, page 12)		
13	Burner		512-200-076
14	Screw, 10-32 x 0.38 STP type 23 hx, washer Hd slot		562-135-710
15	Rollout thermal fuse element		512-050-230

12d Replacement parts — jacket

Figure 41 Jacket assembly

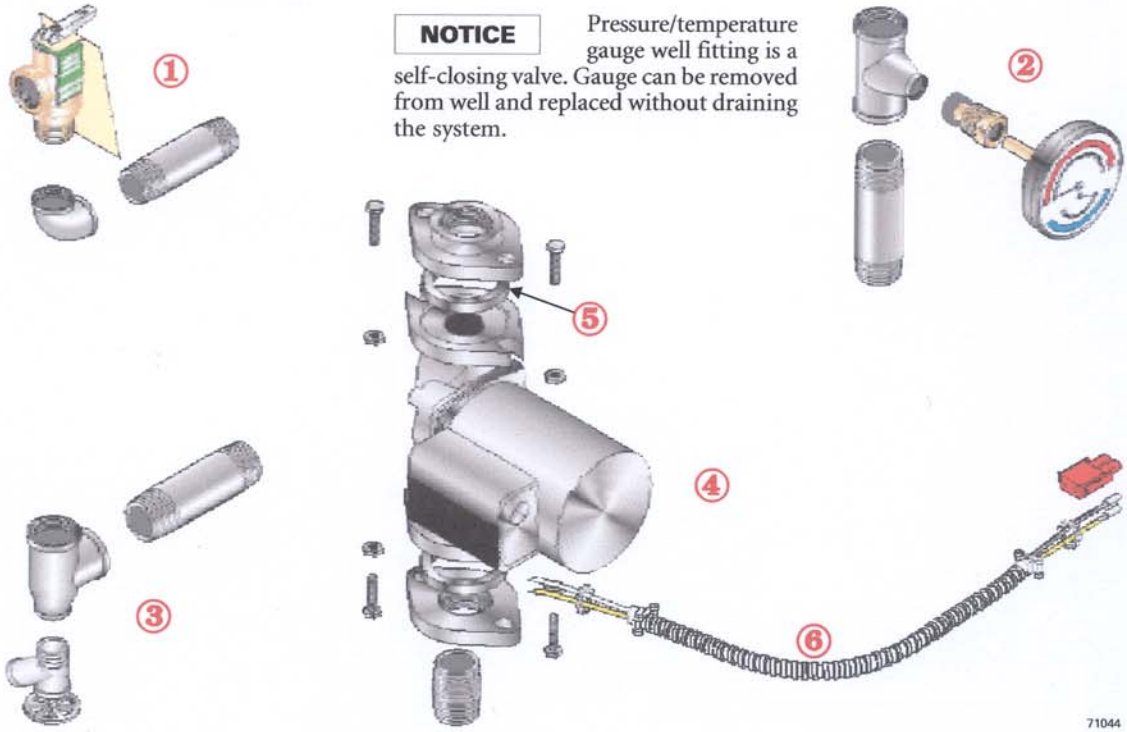


Item number	Description		Weil-McLain part number
1	Junction box, 2 x 4 x 1.5		591-804-610
2	Jacket panel, left side, with insulation		431-223-288
3	Jacket panel, right side		431-223-311
4a	Jacket panel, top front	CGi-25 & CGi-3	431-223-338
		CGi-4	431-223-339
		CGi-5	431-223-340
		CGi-6	431-223-341
		CGi-7	431-223-342
		CGi-8	431-223-343
4b	Jacket panel, top rear	CGi-25 & CGi-3	431-223-359
		CGi-4	431-223-360
		CGi-5	431-223-361
		CGi-6	431-223-362
		CGi-7	431-223-363
		CGi-8	431-223-364

Item number	Description		Weil-McLain part number
5	Jacket panel, door	CGi-25 & CGi-3	431-223-315
		CGi-4	431-223-316
		CGi-5	431-223-317
		CGi-6	431-223-318
		CGi-7	431-223-319
		CGi-8	431-223-320
6	Jacket cross tie, bottom front	CGi-25 & CGi-3	431-223-325
		CGi-4	431-223-326
		CGi-5	431-223-327
		CGi-6	431-223-328
		CGi-7	431-223-329
		CGi-8	431-223-330
7	Jacket panel, interior	CGi-25 & CGi-3	431-223-290
		CGi-4	431-223-291
		CGi-5	431-223-292
		CGi-6	431-223-293
		CGi-7	431-223-294
		CGi-8	431-223-295
8	Jacket panel, rear	CGi-25 & CGi-3	431-223-300
		CGi-4	431-223-301
		CGi-5	431-223-302
		CGi-6	431-223-303
		CGi-7	431-223-304
		CGi-8	431-223-305

12e Replacement parts — trim

Figure 42 Trim assembly

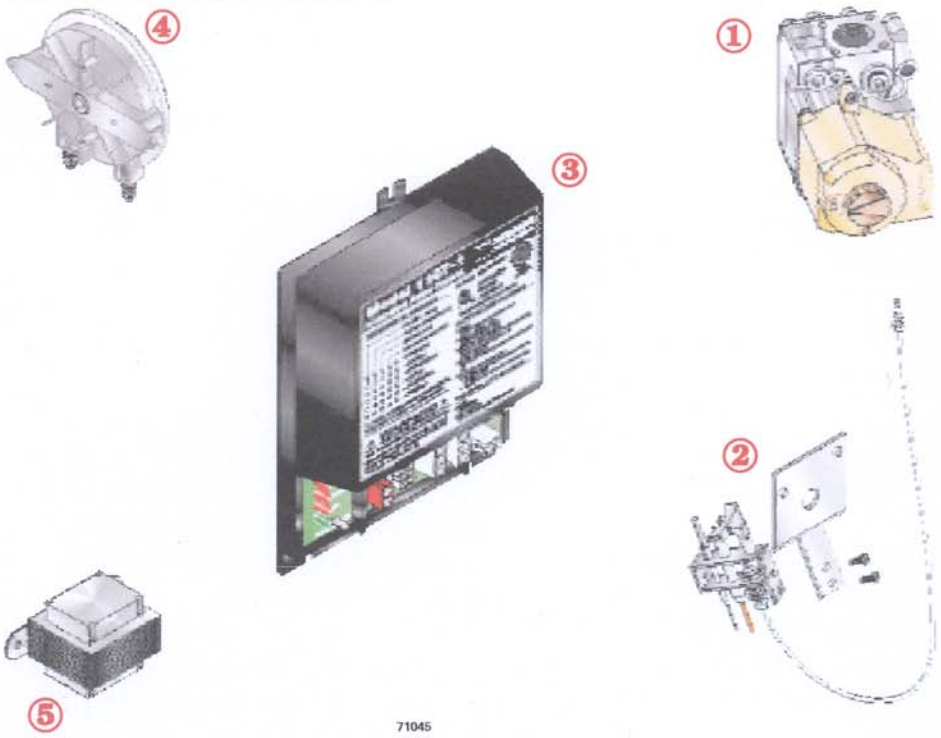


NOTICE Pressure/temperature gauge well fitting is a self-closing valve. Gauge can be removed from well and replaced without draining the system.

Item number	Description	Manufacturer	Manufacturer's part number	Weil-McLain part number
1	Pressure relief valve, ASME, 30 PSIG, ¾" male inlet Pressure relief valve, ASME, 30 PSIG, ¾" female inlet *(Fittings shown are factory-installed on boiler.)*	Conbraco Watts Conbraco Watts	10-407-10 M330 10-408-05 335	511-546-920 511-546-924
2	Combination pressure-temperature gauge, 2 ½" short shank, self-closing valve (*Fittings shown are shipped loose with boiler.)*	ENFM	4104	510-218-047
3	Drain valve, ¾" *(Fittings shown are included with boiler.)*	Conbraco Hammond Valve Matco-Norca Watts	31-606-01 710 205F04 BD-2C	511-210-423 511-246-392 511-246-392 511-246-392
4	Circulator *(Fittings shown are shipped loose with boiler.)*	Bell & Gossett Taco	NRF-22-103253 007	511-405-118 511-405-113
5	Circulator gasket, universal (2 per boiler)	Weil-McLain		590-317-535
not shown	Circulator hardware kit, includes: 1 flange, 2 nuts, 2 screws, 1 gasket — ¾" NPT — CGi-25 1" NPT — CGi-3 through CGi-5 1¼" NPT — CGi-6 and CGi-7- 1½" NPT — CGi-8	Weil-McLain		 381-354-530 381-354-525 381-354-526 381-354-531
6	Circulator wiring harness kit, with Molex *(loose)*			381-354-528

12f Replacement parts — controls

Figure 43 Gas control assembly



Item number	Description	Boiler model	Manufacturer	Manufacturer's part number	Weil-McLain part number
Natural gas components					
1	Gas valve, ½" x ½"	CGi-25 — CGi-6	Honeywell	VR8204A2001	511-044-381
			White-Rodgers	36E36-266	511-044-381
	Gas valve, ¾" x ¾"	CGi-7 & CGi-8	Honeywell	VR8304M4002	511-044-353
			White-Rodgers	36C68-478	511-044-353
2	Pilot kit w/orifice & aluminum pilot gas tubing		Weil-McLain		511-330-080
Propane gas components					
1	Gas valve, ½" x ½"	CGi-25 — CGi-6	Honeywell	VR8204M2701	511-044-354
			White-Rodgers	36E36-291	511-044-354
	Gas valve, ¾" x ¾"	CGi-7 & CGi-8	Honeywell	VR8304M4010	511-044-355
			White-Rodgers	36C68-479	511-044-355
2	Pilot kit w/orifice & aluminum pilot gas tubing		Weil-McLain		511-330-081
Natural gas and propane gas components					
3	Control module		United Technologies	1107-1	511-330-087
not shown	Wiring harness		Weil-McLain		591-391-894
4	Air pressure switch		Tri-Delta		
	1.79" w.c.	CGi-25 & CGi-3		PPS10171-3013	511-624-401
	1.40" w.c.	CGi-4		PPS10171-3094	511-624-302
	1.12" w.c.	CGi-5		PPS10171-3095	511-624-303
	0.80" w.c.	CGi-6 & CGi-8		PPS10171-3096	511-624-304
	0.75" w.c.	CGi-7		PPS10171-3031	511-624-405
5	Control transformer				511-842-370
not shown	Tubing, air pressure switch, 0.12 I.D. silicone		Lydall		
	red, to collector hood				590-317-650
	white, to transition				590-317-651

13a Dimensions

Figure 44 Dimensional drawing

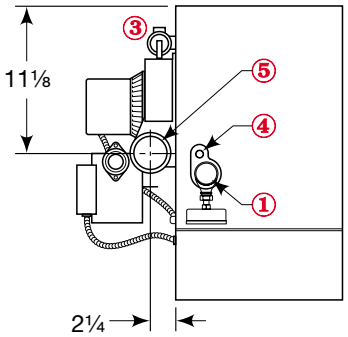
① Supply piping (*note 1*)

② Return piping (*note 1*)

③ Relief valve, ¾" NPT

④ ½" NPT to expansion tank/air vent

⑤ 3" Diameter vent



TOP VIEW

⑥ Gas supply piping

⑦ Drain valve

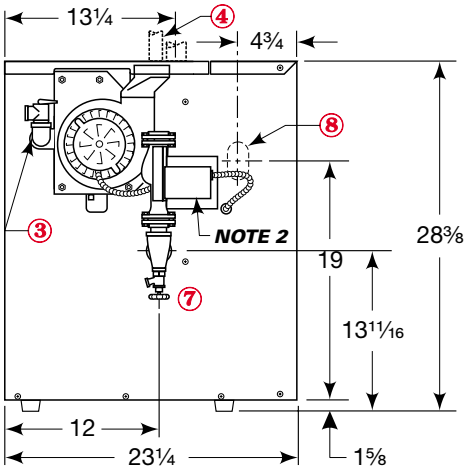
⑧ Gas supply entrance (right or left side)

⑨ Pressure/temperature gauge

Note 1: Boiler supply and return tappings are both 1¼" NPT. See **Table 6**, page 20 for recommended system supply and return piping sizes.

Note 2: Boiler circulator is shipped loose. Circulator may be mounted on either boiler supply or return piping. Circulator flange provided with boiler is same size as recommended pipe size in **Table 6**, page 20.

ALL DIMENSIONS IN INCHES



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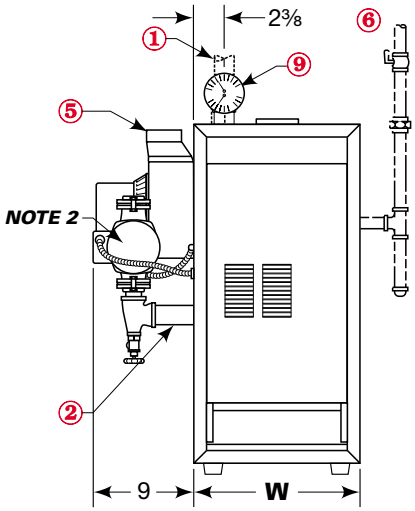
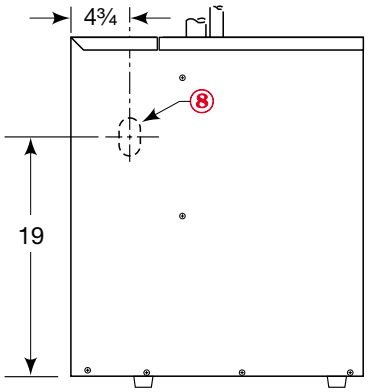
LEFT SIDE



FRONT



RIGHT SIDE

Boiler model number	Supply tapping (inches NPT)	Return tapping (inches NPT)	Gas connection size Note 3 (inches NPT)	Gas manifold size Note 3 (inches NPT)	"W" Jacket width (inches)
CGi-25	1 ¼	1 ¼	½	½	10
CGi-3	1 ¼	1 ¼	½	½	10
CGi-4	1 ¼	1 ¼	½	½	13
CGi-5	1 ¼	1 ¼	½	½	16
CGi-6	1 ¼	1 ¼	½	½	19
CGi-7	1 ¼	1 ¼	¾	¾	22
CGi-8	1 ¼	1 ¼	¾	¾	25
Note 3:	Gas piping from meter to boiler to be sized per local utility requirements.				

13b Ratings

DOE

Table 10 Boiler ratings

Boiler model number	DOE Heating capacity (Btuh)	0–2,000 feet altitude		2,000–4,500 feet altitude		Net I=B=R ratings (Btuh)	Boiler water content (gallons)	DOE Seasonal efficiency (% A.F.U.E)	Vent size
		Input (Btuh)	Output (Btuh)	Input (Btuh)	Output (Btuh)				
(Note 1)	(Note 2)					(Note 3)			(Note 4)
CGi-25	42,000	50,000	42,000	45,000	38,000	37,000	1.5	84.0	3"
CGi-3	57,000	67,000	57,000	60,000	51,000	50,000	1.5	84.3	3"
CGi-4	85,000	100,000	85,000	90,000	76,000	74,000	2.1	84.0	3"
CGi-5	112,000	133,000	112,000	120,000	101,000	97,000	2.7	83.7	3"
CGi-6	140,000	167,000	140,000	150,000	126,000	122,000	3.3	83.3	3"
CGi-7	167,000	200,000	167,000	180,000	150,000	145,000	3.8	83.0	3"
CGi-8	194,000	233,000	194,000	210,000	175,000	169,000	4.4	82.7	3"

Notes

1. Add "PIN" for natural gas boiler - "PIL" for propane gas boiler.
2. Based on standard test procedures prescribed by the United States Department of Energy.
3. Net I=B=R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Ratings are based on a piping and pickup allowance of 1.15. An additional allowance should be made for unusual piping and pickup loads.
4. CGi boilers require special venting, consistent with Category I or III boiler. Use only the vent materials and methods specified in this manual. Vent diameter shown above is for direct exhaust venting. See **Table 3**, page 14, for vent diameter when chimney draft venting.

NOTICE

CGi boilers for residential radiant panel systems, converted gravity heating systems or other low water temperature applications should be installed with balancing valves and bypass piping equal to the supply and return size to avoid excessive flue gas condensation due to lower operating water temperatures. For alternate piping, contact your Weil-McLain sales office. CSA design certified for installation on combustible flooring. Tested for 50 psi working pressure.

Handling fiberglass and ceramic fiber materials

REMOVAL OF COMBUSTION CHAMBER LINING OR BASE PANELS

WARNING

The combustion chamber lining or base insulation panels in this product contain ceramic fiber materials. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).":

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining or base insulation to prevent airborne dust.
- Remove combustion chamber lining or base insulation from the boiler and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- Eye: Irrigate immediately
- Breathing: Fresh air.

REMOVAL OF FIBERGLASS WOOL — OR —

INSTALLATION OF FIBERGLASS WOOL, COMBUSTION CHAMBER LINING OR BASE PANELS:

WARNING

This product contains fiberglass jacket insulation and ceramic fiber materials in combustion chamber lining or base panels in gas fired products. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation.

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for fiberglass wool at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Operations such as sawing, blowing, tear out, and spraying may generate airborne fiber concentration requiring additional protection.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- Eye: Irrigate immediately
- Breathing: Fresh air.